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MEMOIR OF JOHN SHAW BILLINGS[1]

IT has been the custom of the National Academy of Sciences to commemorate in memoirs those whom death has removed from its ranks. Since the lives of men of science are little known except to those engaged in their own lines of research, some record is the more to be desired of one who illustrated the fact that scientific capacity may exist with varied ability for the conduct of large affairs. This combination of talents has been often found in the ranks of the Academy, although in the belief of the public, the man of science is presumed to be incapable of the successful management of commercial business.

The many tasks to which his life of work summoned the subject of this memoir have become, since his death, for the first time so widely known that it is unnecessary for me to do more than to put on paper a brief summary of his career and the reasons for his election to this distinguished body of men of science, where from 1887 to 1889 he rendered efficient service as our treasurer and served on eight important committees or as a member of our council. The life of our fellow member, in fact, needs less restatement from us, because since he died at least a half dozen men of importance have recorded their opinions of this attractive and much-loved man and of what he effected during his ever-busy existence. Moreover, a full and competent biography has been undertaken, and will, I am sure, do ample justice to one who owed nothing to newspaper notoriety. Through his mod-

[1] Read before the National Academy of Sciences, Baltimore, November, 1913.

est life of the labor he loved he accepted grave burdens and whatever duties, official or other, fell to him, apparently indifferent to praise or popular reputation while he dealt victoriously with tasks so various in their nature that any one of them would have sufficed to tax the technical competence of the most able man.

John Shaw Billings was born in Switzerland County, Indiana, April 12, 1838. From the time he went to college until after the end of his medical studies he was almost entirely without exterior aid. He was graduated from Miami University in 1857; A.M. in 1860. His personal struggle for a college education and the sacrificial privations by which he attained his medical degree in 1860 from the medical college of Ohio will, I trust, be told in full elsewhere. He won his way unhelped by taking charge of the dissection rooms and for one entire winter, as he assured me, lived on seventy-five cents a week, as he believed to the serious impairment of a constitution of singular vigor.

Hospital service gave him what the imperfect medical teaching of that day did not give and, as demonstrator of anatomy, he prepared himself for surgical practise, which was to find its opportunities in the clinics of the battlefield.

In the year 1861 came one of the many periods for decisive choice he was to encounter as life went on. A certain career as assistant to a busy surgeon was offered him. His strong sense of duty to his country made him decline the tempting opportunity and he entered the regular army first of his class in a competitive examination and was commissioned assistant surgeon, U. S. A., April, 1862.

To deal briefly with his army career, he became surgeon captain in 1866, surgeon-major in 1876, and colonel and deputy surgeon general in 1890. He was retired from active service in 1895 by President Cleveland at his own request and through the influence of the University of Pennsylvania, which at this time offered him the place of professor of hygiene.

During the war he was breveted major and lieutenant-colonel for faithful, gallant and meritorious service. Dr. Billings won in the field a high reputation as a very skillful and original operative surgeon, and a character for courage and resourceful administrative ability on many occasions, but especially when after the disastrous battle of Chancellorsville he conducted the retreat of the wounded and when later he was actively engaged in perilous service during the battle of Gettysburg.

While in army service he began very early to exhibit his constructive talent in altering or building hospitals, and his remarkable power of administrative command in these vast homes of the sick and wounded.

Without dwelling too much on this part of his career, I may say that there were many months of service in the field and also as an acting medical inspector of the Army of the Potomac. Dr. Billings's war service with the army ended when, in December, 1864, he was ordered to Washington, where he had charge of the invalid reserve corps, of matters relating to contract surgeons and a variety of other business.

Some time in 1864 he was sent by the President with others to the West Indies on an errand connected with the futile plan for deporting some of our recently made freedmen to an island. This scheme appears to have failed, as might have been expected, and probably the expedition in which he was included was meant to bring back the men previously thus deported. It was a somewhat fantastic scheme and I do not find any account of it in the histories

of the war. Probably Dr. Billings had an important share, for here, as elsewhere, no matter what his relation was to a body of men and officers, his peculiar talents soon found their influential place.

It becomes clear from what I have already said that his capacity to turn with ease from one task to another must have become by this time very well known to his superiors. His own desire was to return to the field, but the promise to so indulge him probably failed owing to the somewhat abrupt termination of the war. Meanwhile he was required to deal with the voluminous medical reports sent in by the medical staff of the Potomac Army. The records of this work and of his other more individual surgical contributions are scattered through the voluminous medical and surgical history of the war. Here as elsewhere he left in these papers his mark as a man of many competencies.

Some of the duties to which he was assigned before his retirement were curiously outside of the work of a military surgeon and he seems to have been lent by the War Department for a variety of governmental services. Thus while busy with the early work in connection with the museum and library, he was also occupied with the organization of the United States Marine Hospital Service in 1870. In 1872 he was vice-president of the brief lived National Bureau of Health, and was for a long period in charge of the division of vital statistics of the eleventh census of the United States.

During his career as a surgeon in the years before 1895, he became an authority on military medicine and public hygiene and revived his interest in hospital construction to which he had given a great deal of thought. He was one of five who submitted in 1875, by request, plans for the construction of the Johns Hopkins Hospital. His careful study of the conditions required in a hospital were accepted. They included many things novel at that time which it is not needful for me to dwell upon here, but some of them were very original changes from the organization and construction to be found in hospitals at that period.

During these years he went to Baltimore from time to time and lectured on the history of medicine and on hygiene. He also supervised the planning and construction of the Barnes Hospital of the Soldiers' Home, Washington, D. C., and later the buildings needed for the Army Medical Museum and the Surgeon General's Library. His final constructive work late in life was his connection with the plans for the Brigham Hospital in Boston and during many years he was continually consulted by institutions or cities in regard to hospitals and hygiene questions of importance.

The great work of John Shaw Billings which gave him finally a world-wide repute began at some time after 1864, when he was asked by the surgeon general to take charge of the army medical museum created under Surgeon General Hammond by the skillful care of Surgeon John H. Brinton. His formal assignment "in charge of the Museum Library Division and as curator of the Army Medical Museum" dates from December 28, 1883, but he had been informally librarian for many years before that time. It is quite impossible here to enter into any detailed account of the ingenuity and power of classification which has made this museum the greatest presentation of the effects of war on the bodies of men. It is, however, essential to say a few words about the varied capacities which built up and made finally available to scholars the library of the surgeon-general, now the

most completely useful collection of medical works in the world.

In some reminiscences of his younger days he speaks of his student aspiration "to try to establish for the use of American physicians a fairly complete library and in connection with this prepare a comprehensive index which should spare medical teachers and writers the drudgery of consulting thousands or more indexes or the turning over the leaves of many volumes to find the dozen or more references of which they might be in search." The opportunity he craved when young came now by singular good fortune into his possession. When he took hold of this work, the surgeon-general's library contained a little over a thousand volumes and all interest in its increase had been long at an end. Fortunately, as I so understand, at the close of the war there fell into the hands of the surgeon-general some eighty-five thousand dollars, the result of hospital savings during the great contest. He was allowed to use this money for the building up of the museum and of the library, which was an essential adjunct to the collection. It was a vast piece of good fortune that this task fell to the man who had craved such a chance since his youth. He brought to it powers which are rarely united in one man and an amount of knowledge of books, medical and non-medical, which few possess. When he was nominated for membership in the National Academy of Sciences, his claim to this high distinction was judiciously founded by his friends upon his application of skill in the scientific classification of books and of the medical knowledge of our profession through the centuries. No medical librarian who ever lived had, up to that time, shown such an almost instinctive capacity for the scientific classification of knowledge so as to make it readily available. It was eminently a scientific gift and of incredible usefulness in its results to the scholarship of medicine throughout the world.

When he gave up this charge at the time of his appointment to the chair of hygiene in the University of Pennsylvania, he received from the physicians of Great Britain and America at a dinner given in his honor a silver box containing a cheque for ten thousand dollars, as a material expression of gratitude for the labor-saving value of his catalogue.

The surplus of this fund enabled his friends to present to the Surgeon-General's library an admirable portrait of John Billings, by Cecelia Beaux.

The library as he left it contained 307,455 volumes and pamphlets and 4,335 portraits of physicians. At the present day in the skillful hands which took up his task, it has reached over half a million volumes and over five thousand portraits and has a unique collection of medical journals quite matchless elsewhere.

He went about the preliminary measures for the catalogue with cautious care and in 1876 prepared a specimen fasciculus of the proposed catalogue of the library, consisting of a combined index of authors and subjects arranged in dictionary order, and submitted it to the profession for criticism. In this he was aided by his able assistant, Dr. Robert Fletcher. In the first series of the index catalogue, 1880–1895, the material was selected and a scientific classification made by Billings. As a monthly supplement to the index catalogue, the Index Medicus was begun by Dr. Billings and Dr. Fletcher in 1879 as an extra official publication. When, in 1903, the second series of the Index Medicus was issued, it was seen that there was a risk of failure in this invaluable publication through want of means, but at this time by Dr. Billings's influence through the aid of the Car-

negie Institution of Washington, it was permanently established at the cost of some twelve thousand dollars a year and continues to be a helpful aid to scholarly physicians all over the world.

It was thus that Dr. Billings got his trainings for the still larger task which awaited him when he was chosen as librarian of the Astor-Tilden-Lenox library in New York. There at once this great enterprise found in him all the varied qualities which were needed in the construction of the building, the classification of its contents, the efficient administrative grasp on the forty outlying libraries of New York connected with the triple library, and in his singular power of uniting strict discipline with a capacity to attach to him those under his control.

Throughout his life he was a busy writer of essays on hygiene, hospital construction and administration, the statistics of war and addresses or essays such as his history of surgery, perhaps the best presentation of this subject ever made.

To comprehend the character of a man, he must have been seen in his relation to the various duties which test the qualities of both heart and head. The charge of suffering, crippled, wounded soldiers is a trial to the surgeon and here he showed the man at his best. He was patient with the impatient, never irritable with the unreason of sufferers, never seeming to be in a hurry, and left at every bedside in the long sad wards the impression of being in earnest and honestly interested.

It was thus I first knew John Billings when in the crowded wards wearied, homesick men welcomed his kindly face and the almost womanly tenderness he brought to a difficult service.

My own personal relations with John Billings began in the Civil War when he had for a time the care of my brother, a medical cadet, during a mortal illness contracted in the Douglas Hospital, Washington. I saw then how gentle-minded was this man and how he realized the pathetic disappointment of a highly gifted young life consciously drifting deathward. I saw thus a side of John Billings he rarely revealed in its fullness. Generally a rather silent man, he was capable now and then of expressing in eloquent brevities of speech the warmth of his regard for some one of the few he honored with his friendship. In the last talk I had with him, he said to me some things which remain as remembrances of this rather taciturn and reserved gentleman. I had asked him how many degrees and like honors he had received and, considering these notable recognitions, I remarked on the failure of popular appreciation. He replied with a jesting comment and then said, after a brief silence, that he was far more proud of his capacity to win the friendship of certain men and of the service he had been able to render to science in his connection with the Carnegie Institution of Washington. There indeed his always wise and broad-minded interest will be greatly missed. I served with him from its foundation on the distinguished executive committee of this body. Here, among men he liked and trusted, we saw him at his familiar best. Always a patient listener, his decisions as chairman were expressed with his quiet, courteous manner, and many times his large knowledge of the science of the day left me wondering how it could have been attained amid the amazing number of occupations which had filled his time. But in fact he was intellectually sympathetic with every form of scientific research, a somewhat rare characteristic among investigators. I ought also to say that the men of our committee and of the board of trustees felt at times a little surprise at the shrewdness, the common sense

and the commercial insight he brought to the critical financial consideration of this immense money trust. Not elsewhere was he better seen or understood as conveying the sense of character, and nowhere else was he better loved.

Numberless presidencies of societies fell to his share, and the list of his honorary titles from all of the greater academies and universities at home and abroad served at least to show in what esteem he was held by men of science. These recognitions gave, I suspect, more pleasure to his friends than to this retiring and singularly unambitious scholar.

On public occasions, his personality stood for something in the estimate of the man. Tall and largely built, he was as a speaker in the after-dinner hour or when addressing a body of men a commanding presence, with flow of wholesome English, ready wit and humor such as rarely came to the surface in his ordinary talk. The figure of athletic build, the large blue eyes, a certain happy sense of easy competence, won regard and held the respectful attention of those who listened. For me there was always some faintly felt sense of that expression of melancholy seen often in men who carry through a life of triumphant success the traces of too terrible battle with the early difficulties of their younger days.

What was most exceptional in this man was the unfailing fund of energy on which he drew for every novel duty and an industry which never seemed to need the refreshment of idleness. He had that rare gift—the industry of the minute. When once I spoke of the need for leisurely play and the exercise of open-air sports, he said that he obtained recreation by turning from one form of brain use to another. That was play enough. I ought to add that he found pleasure in reading novels, saying that one or two of an evening late were agreeable soporifics. But these, like more serious books, he devoured rather than read as most men read, and what he read he seemed never to forget. His memory was like a good index of a vast mental library.

Until his later years Dr. Billings possessed the constitutional vigor which befriended him earlier as he responded to the call of a succession of military and civic duties. Of late years he was obliged to undergo several surgical operations of serious nature. He went to them with confidence and courage, but before the last one he said to me, "I am for the first time apprehensive." He went on to add, "It is a signal of age; and of late, as never before, any new project, any need for change in the affairs of the library, I find arouses in me an unreasonable mood of opposition. This too is, I know, a sure evidence of my being too old for my work. I shall, I think, resign my directorship of the library." It was our last intimate talk. He died of pneumonia after the operation, on the eleventh of March, 1913.

The scene at his burial in the military cemetery at Arlington brought together many men of distinction, a much moved group of army men and the great library officials. We left in the soldier burial ground all that was mortal of a man who combined qualities of head and heart such as none of us will see again.

Dr. Billings married Miss Kate M. Stevens, in September, 1862. Their children are: Mary Clure, Kate Sherman, Jessie Ingram, John Sedgwick and Margaret Janeway.

Science is forever changing. The work of to-day is contradicted to-morrow. Few indeed are so fortunate as to leave in the permanent remembrance of science conclusive work. The man whose loss we regret

left to medicine in his catalogue of the Surgeon General's Library a monumental labor which none will ever better and to which he gave continuity of vigorous life.

S. WEIR MITCHELL

THE DUTY OF THE STATE IN THE PROSECUTION OF MEDICAL RESEARCH[1]

IT is an interesting manifestation of apparent humility and unwonted lack of self-conceit that man should have hesitated so long to emphasize the primary responsibility of the state for the physical well-being of its citizens. Health is a fundamental resource not only of the individual, but, in a very real sense, of the state itself. The happiness, the efficiency, and even the existence of every citizen is threatened by the presence of disease in the individual home. It would be interesting to discuss why an educated nation has so long permitted the existence and even encouraged the extension of sickness and disease among its citizens by failing to take means for the correction of the individual evil, and for the prevention of its dispersal among other unaffected members of the community. Discussion of this feature would demand more time than is reasonable on this occasion, and it is sufficient to have indicated the existence of influences which stand in the way of efficient work for the conservation and improvement of public health.

The state university has been organized and developed by the state in order to supply that trained knowledge which is essential for the comprehension and solution of modern problems. Unwilling that all knowledge should come to the public through private citizens, or that the dissemination of knowledge and the methods of its application should be dependent upon the liberality of the fortunate individual or in any way hampered by the conditions under which private munificence is granted and expended, the state itself, that is, the common men and women of the community working together, have contributed each one of their means and according to their ability that they may have in their midst a center of influence ready and able to gather the best knowledge from all sources, to assimilate it to their purposes, to apply it for their protection and advancement, and thus to make possible a broader and richer and freer and fuller life than they working singly could ever attain. Every man and every woman in the entire commonwealth who has sufficient honor and self-respect to pay taxes has contributed to the support of the state university as a whole, and of every one of its individual departments. The responsibility that the university and every one of its individual departments assumes is thus definite and grave. It involves the very best possible application of funds which represent many instances of self-denial and privation on the part of individual citizens that it may further the interests of every one of those citizens in the most efficient manner. This is the problem which stands before the medical department of the University of Nebraska in its new quarters so generously provided and admirably adapted for the work of medical education, primarily in its relation to the state of Nebraska itself, but since we are all members of one nation, and of one family of nations, in constant, intimate, and unavoidable contact with each other, really also in its relation to the nation and the entire world.

Men look at things from different points of view. Toiling up the steeps of knowledge, we reach different coigns of vantage, from which we may look out and get a somewhat imperfect and incomplete view of the achievements of the past, and the paths that lead on to the higher attainments of

[1] Address at the dedication of the medical laboratories at the University of Nebraska.

the future. The view that each one gets is imperfect, and there are few of us who feel that we have risen high enough to command a really broad and comprehensive survey of the situation. For my part, it is with great diffidence that I express any opinion, especially in the presence of the deservedly famous scholar and investigator who follows me, and who has contributed in many ways so definitely and richly to the progress of the nation in medical matters. And yet there are some elements in the responsibility, as I see it, of this institution to the community which has founded and is supporting it, that are unmistakable in their appeal to every one. If they appear to you so commonplace that you wonder at their recital here, may I suggest that the restatement of fundamental relations is not only valuable but indispensable when, on such occasions as this, men and women come together to do honor to a great institution and set the seal of public approval on the facilities which it has created for work, as well as to give inspiration and direction to the increased influence and opportunity that grow out of the greater possibilities in the new environment. There is always some danger that a new movement loses sight of fundamental responsibilities, and in emphasis upon one opportunity forgets to do equal justice to the others that surround it and rightly expect their appropriate attention and emphasis. What are the primary duties of this school in its new home? Only those laid upon it at its organization, even though now in a richer environment they acquire a new and stronger emphasis.

The first duty that suggests itself in any discussion of the state university is that of education, and in the minds of many the duty is limited to its narrower significance of the word, *i. e.*, to training in set classes and courses those who present themselves with adequate preparation and fixed purpose to achieve the special end they seek. But many universities have neglected to consider that it is neither possible nor desirable for the single institution to give instruction in this narrow sense to each and every citizen desiring the training. Many of our state universities have hampered their usefulness by striving to teach more students in more ways than the means at their command would justify. They have duplicated opportunities of the routine sort and have been overwhelmed by masses of elementary students whose training added little except political strength to the influence of the university or to the welfare of the state, and only mere commonplace finish to the training of the individual. Every time the university takes a student from another institution, either high school or academy, college or technical school, before he has legitimately utilized the opportunities which that institution offers for his purposes, it has contributed to the disintegration and destruction of the educational strength of the community. Every time a university admits a poorly trained or mentally incompetent student or retains in its class-rooms a time-serving, shirking idler, indifferent to his opportunities, it does a grave injustice to the energetic and ambitious workers in its halls, and may fairly be charged with misuse of public funds. In the mad rush after students, all of our institutions alike have added to their own weakness rather than to their own vigor, and have wasted the resources of the people insofar as they have taken part in the struggle after mere bigness.

If it be no proper ideal to gather in numbers at the expense of fitness, it is certainly a clear function of the state institution to set minimum standards for the entire commonwealth, to indicate what is reasonable training in a given field, and to prevent

the exploitation of the uninformed by private institutions that pretend to prepare, but do not really fit, students for the life work which they are aiming to pursue. Nowhere is the necessity for establishing standards and fixing the conditions of reasonable preparation for professional work more essential than in the medical school. The poorly trained engineer fails to achieve individual success but usually never reaches a stage of independent action in which his lack of training becomes a menace to the public. The poorly trained lawyer loses his client's case, and the public is warned by the evident lack of success on his part to avoid seeking his assistance in important matters. In so far as the interests of his client are interwoven with the interests of the community, he may do definite harm to the general welfare, but that is a blow to prosperity only, and because of the financial relation, the public is quicker to see and to act in the situation than where more subtle interests are threatened. The poorly trained doctor, however, not only fails to discharge his responsibilities to his patients, but is in a very real way a positive menace to the entire community. If he fails to recognize communicable disease and to take definite steps for its isolation, others must pay the penalty. The poorly trained man may be thoroughly honorable, and may strive to the utmost to discharge his own obligation, but if he has not the requisite knowledge, his most conscientious efforts are inadequate to protect the public. Consequently, every individual in the commonwealth is continually and vitally and personally concerned in the proper and thorough training of every man who practises the medical profession within its limits.

The state must get the proper standards of medical training from those who as its representatives are giving medical education in the state university in the name of the commonwealth, and the state must hold these teachers, its representatives, responsible that they set the standards of medical education carefully, so as to protect all its citizens from the consequences of poorly trained or inadequately trained or wrongly trained practitioners of medicine. Once that the medical school of the state university has established this standard and has applied it without fear or favor to its own students, the authorities of the state in legislative and administrative circles must for the protection of the commonwealth adopt and apply those standards not only to the students who receive training at the hands of the state, but to all persons who desire to enjoy the privileges of medical practise within the limits of the state. No nation could lay claim to membership in the group of progressive civilized communities that coined its own money on one standard and permitted private citizens to circulate money based on standards of their own choosing; and yet there are apparently intelligent commonwealths in our union that have seen one standard set for the education of professional men in their own universities, and have permitted private institutions to adopt other standards of their own making, to grant degrees of all sorts without regard for their actual value, and to turn loose upon the public professional men whose certificates of proficiency are no better than wild-cat banknotes. Nor is this establishment of standards by the state calculated to arouse resentment or opposition on the part of those private institutions which are seeking without regard to personal gain to discharge their obligations to the public. The very appreciation of such obligations and the renunciation of personal gain which enters into the legal organization of such institutions, make

them welcome the careful study of methods and standards by the state universities, since their own conditions often do not permit them to engage extensively in the investigation and solution of complicated educational problems.

It would be unfortunate for the commonwealth, however, if the entire energies of any college in its state university were expended upon the establishment of standards for proper training, and upon the application of those standards to a limited number of students. The state must look to the college for direction in those technical and professional matters that are entering more and more every year into the organization and development of our complex civilization. Municipal and state officers meet problems that they can not possibly solve without the advice and assistance of expert workers in various lines. There is a well-marked tendency to seek such consulting experts within the limits of the state university faculty; and where formerly men of no connection with the state or responsibility for the problem other than that indicated in the acceptance of a fee for a professional opinion, were summoned from a distance to solve the educational or engineering or hygienic problems of the community, to-day, states are looking for their help in determining the form of legislation, the principles of education or organization, and the methods of applied science in every field, to the universities that have been founded and developed at public expense. Such a tendency is not only natural but inevitable. There should be nowhere better trained and better informed men in any field than those who are called to serve the highest educational institution of the state in a particular line of work. There are nowhere men freer from bias, men more untrammeled by private influence or better calculated to resist insidious and insistent pressure, or men more devoid of other interests and more thoroughly devoted to the public welfare than those who have taken upon themselves the duties of teaching in the public university.

It is hardly necessary to take time to apply this principle in detail to the work of the medical college. Trained experts are nowhere more seriously needed and unfortunately also more difficult to secure than in the field of public health with its manifold relations to municipal sanitation and individual and community hygiene. Here it is that the research man justly maintains his preeminent position. If the water supply of a great city is contaminated, and the health of the entire community is threatened, it is the bacteriologist to whom municipal authorities rightly turn for information as to the precise source of the difficulty and advice as to the best methods of correcting it. If the exploitation of the public by unscrupulous purveyors of adulterated foods is to be prevented, a campaign must be based on the definite evidence which is furnished in the laboratory of the chemist. The public can not be protected unless it can assemble on its side a force of consulting experts and professional investigators whose training is broad enough and whose standing is high enough to enable them to compete successfully with the paid experts who can be summoned by great corporations and important interests and who by their partial exposition of the truth becloud the issue and protect the wrongdoer at the expense of the whole people. The state must have and must use the expert staff of its medical school in the service of the public.

There is a third function of the state professional school which I consider to be equally important, although less generally

recognized by the average man and woman because its meaning is more obscure and its relation to the ordinary affairs of life more difficult to demonstrate clearly. I mean the duty of the school as a center for continued research. The relation between highly trained men of the research type and the proper education of professional students is too clear to need extended demonstration. Standards can be set and applied only by those who have the broadest and strongest command of the professional situation. Then, also, the advice on technical problems which is to be furnished the state in time of need can come only from those who have themselves enjoyed the most thorough training and have demonstrated their ability as original workers in their individual fields. It is, however, equally essential that the professional school should be a center of continued experimental work. The discoveries of science that follow one another with such rapidity in these days must be tested, extended, applied, in order to have the maximum value for the race. The ability to test such discoveries depends very definitely upon acquiring, retaining and exercising the research habit. Unless a man keeps on investigating, unless he continues to experiment, he is not in a position to give the right value to a new discovery, or to place it in its correct relation to the other facts in his field, and to interpret it in a thorough and practical manner for the benefit of the community. The man who has devoted himself exclusively to teaching, or exclusively to the practise of his profession, whose entire mental energies are expended in carrying out his program of education, or in discharging his responsibilities to those who seek his advice and counsel, can not fully discharge his duties towards the state as the member of a professional faculty. As the delta of the river is gradually built up by the continued accumulation of myriads of minute particles, so the knowledge of one generation reaches a higher level by minute additions which come to it from a multitude of individual sources. If knowledge is to advance, and science to become more useful to the human race, if the life of to-morrow is to be richer and more varied than that of to-day, if the man of the future is to be freer from disease and more perfect in physical development, both individually and collectively, than the man of to-day, then every worker in the field of science must contribute at least his little part to the accumulation of new facts and new relations upon which in ultimate analysis this advance depends. The teacher who is adding to his knowledge only by the reading of that which has been acquired by others, is failing to cultivate a power that is of fundamental value to the institution and to the commonwealth. The expert who is merely repeating the work that he has done over and over again, who applies to every new situation only the methods and results of older experimenters, is not doing his part towards the institution he represents and the community that claims his service. It is not only true that the men who have contributed the great advances in knowledge have been those who applied themselves insistently to independent investigation, but also that the inspiring teachers and the efficient directors of public activity have been conspicuous for their devotion to research and their contributions to knowledge. Medical science is of recent growth. The application of discoveries in allied sciences to the cure and prevention of disease has yielded splendid results, but the work has only just begun and rich opportunities await the coming of new investigators. The welfare of the race demands

that the state do its part in cultivating this fertile field of research. Whatever private institutions may do, the state has no choice. The men who are its teachers must also be investigators and must contribute their share to the extension of knowledge.

I trust that my discussion thus far has not failed to call clearly before your minds the three features which I consider to be all-important in every university professional school. I hope that my brief statements have suggested to your minds the varied functions of the university teacher so clearly that you are ready to grant him the duties beyond those of the mere pedagogue. Routine teaching may be done equally well in any institution. Expert analysis and investigation, however, are limited to our great universities, because of their demands upon space and time and money. The state university which fails to take account of these duties, which loads its faculty members with teaching to such an extent that they have no time or energy left for other items, is not only doing itself a great injustice, but is false to its responsibilities to the state. Research opportunities should be provided for its staff, and research work should be demanded of each member. Provision for laboratory equipment and space are sometimes included in the plan of college organization when the specified duties of the instructor leave him no time or energy for the prosecution of research. Participation in meetings and conferences is important and may properly be demanded of the scientist in the service of the state, but unless due allowance is made for such activities in arranging the individual work of the teacher, unless he is given also some leisure for research, he will not contribute to the advancement of knowledge or to the protection of the state.

This, then, is the meaning of the new campus and the new laboratory. This, but the first building of a great group, is to be dedicated to the service of the state, with the fullest sense of the responsibilities which that service implies. But other buildings must follow to provide adequately for other lines of teaching, for it is no little work that is inaugurated this year on this new campus and in this first laboratory building. This institution is to furnish for the state of Nebraska to every one of its citizens and through them to the whole world by its teaching and investigation, richer possibilities for human existence. It is to establish here in the center of the great prairie region standards of medical education that will direct the advance in medical training, not only within its borders, but throughout all the surrounding states. It has gathered together here a group of trained experts who may reasonably stand unabashed in the company of any similar group in the great central west. It is to give them opportunity for directing public activity, for protecting public interests, for averting public disaster. They, as scientific men, know their responsibilities and appreciate their opportunities. They are ready to do their work, they are prepared to lead the state in achieving these greater results. They have already contributed to the advance of knowledge, they are eager to continue that work. They are demanding more, not for themselves, but that through it they may give more to the world. It is fortunate that the foundations of the enterprise have been laid in a city that has dreamed of other great possibilities and is realizing them. Equally propitious is the control exercised over its destiny by a great state, devoted to education and justly proud of its own university. Under such conditions, the vision must soon become a reality and other buildings rise be-

side this new structure to extend and multiply its work and to realize the hopes of other workers yet unprovided with adequate facilities, that here may be developed a great institution for the relief of suffering and the service of humanity.

HENRY B. WARD

UNIVERSITY OF ILLINOIS

THE SIGNIFICANCE OF THE NATIONAL BIRD LAW

FOR 125 years, constitutional lawyers and laymen were agreed on at least one thing—that the national government possesses only those powers specifically granted in the constitution, and those reasonably implied from such specific grants. The states possess the residue. There had been, it is true, some argument as to the interpretation to be given to Art. I., Sec. 8, Par. 1 of the constitution as well as to the 9th and 10th amendments. But this was wholly academic, and the consensus of opinion soon crystallized to the above stated proposition.

Yet during our constitutional life of 125 years we have seen remarkable changes going on in this country. The states were isolated and self-sufficient. The stage offered no inducement to travel from state to state, nor the pack horse to trade. To-day, what a revolution in our economic and social life! Railroads, steamships, the telegraph and telephone, along with a thousand other inventions, have made us live a different life. Distance has been shortened; the United States made smaller. One state can no longer satisfy our needs, for all states are interdependent.

Yet more remarkable than all, we live under substantially the same constitution. But only because it is too difficult to amend, for we are to-day confronted with many problems which some think can only be settled satisfactorily by a constitutional amendment. Yet that is next to impossible. It will pay us to glance at a few of the problems that have arisen because of revolutionary changes in our ways of living. For almost half a century the conflict of divorce laws in the states—some lenient, others strict—has been the subject of continual agitation. The origin of the American Bar Association and the origin of the Commission on Uniform State Laws is but an indication of the stir that the diversity in divorce laws must have produced. Yet in spite of continued attention to this subject from 1878, when the American Bar Association was organized, no substantial results have been accomplished; this, though the Commissioners on Uniform State Laws have fought for it for twenty-five years, though a national conference was held at Washington, and though no end of other organizations are urging uniformity of divorce laws. After all this effort three states have uniform divorce acts, and these are not absolutely uniform. The very natural result is that public opinion is turning to the federal government and asking for a national divorce law. But that would necessitate a constitutional amendment.

While not now in the public eye, it was only a short time ago that we heard of the evils flowing from the corporation laws of some states. And no wonder there was criticism when some of the states debauched themselves to an advertising campaign in order to induce incorporation under their laws, the "most liberal," that is the most lax, in the United States. Here too uniformity has been attempted by state action, and as yet not even an act has been agreed upon. Very naturally again public opinion turns to the national branch for relief, demanding either a federal incorporation act, a federal license, or any form of relief that federal action can give. Yet the constitutionality of such a law has been questioned.

In the various states, the progressive element is urging reform on such questions as hours of labor, woman and child labor, minimum wage, protection from machinery, protection from trade diseases, in short all the problems of modern factory life. What kind of opposition is met? A kind that is very difficult to reply to—successfully. The manufacturer says: "Yes, hours of labor should be reduced; children should not be employed; we ought to take greater precautions to protect

our employees; the situation does demand relief; but, however much we should desire all this, it is impossible if we are to continue in this business. We are met with a cold economic fact. Our strongest competitor against whom we can just hold our own [and every industry has such] lives in the state of X, which state is even now more lenient in its factory laws. If you accomplish this reform, you will ruin us. We could not compete under such unfavorable conditions. If you can force the state of X to pass similar laws, we heartily favor these very necessary reforms." And in state after state, year after year, has this type of argument defeated reforms that all felt were reasonable and desirable from every other standpoint. Some of our most progressive states will not listen to such argument, but eventually they must. What again is the result? The public is looking for a national child labor law, a national law for women, hoping to accomplish these reforms by an unwarranted interpretation of the interstate commerce clause. A constitutional amendment is necessary.

In this way the reader could be taken through a host of subjects in which a national law would solve the situation. Yet in each case such a law is either clearly unconstitutional, or constitutional only through some remarkable jugglery which the public to-day expects of the court, in view of the difficulty of amendment. To-day the commissioners on uniform state laws are considering or are urging uniformity in such questions as partnership, negotiable instruments, bills of lading, warehouse receipts, sales, stock transfer, workmen's compensation, taxation, insurance, carriers, conveyancing, acknowledging of instruments, the making and proof of wills as well as many other subjects. One might speak of the evils of double taxation or of the tangling question of situs in taxation; one might recall the insurance scandal in New York some years ago, the reforms put through in some of the states, and the agitation for a national insurance act; but the instances quoted show that quite a delicate situation exists. And in every case it is very unlikely that anything like real uniformity can be accomplished and permanently so by the voluntary action of the states. So that in each case a constitutional amendment would seem to be the only remedy, providing of course that the original and long-accepted thesis is true, namely that Congress possesses only conferred powers or powers implied from them.

Suddenly and almost unnoticed we have presented to us what looks like a solution of the whole difficulty. It is the theory lying back of the national bird law recently passed by Congress, and just being put into effect by the agricultural department, the so-called McLean Bird Act, regulating the killing of migratory and insectivorous birds. On what theory can such a law be constitutional? We shall see.

Almost daily we hear of the ravages of this or that insect. Now it is the San José scale, at another time the locust, sometimes the green leaf louse, and at another the potato bug. Nature has blessed us with an almost countless horde of insects which each year are causing tremendous damage to our crops. Experts have estimated this damage at various amounts. Dr. C. L. Marlatt, basing his estimate on statistics from the Department of Agriculture, concludes that an annual damage of 800 million dollars results. Mr. Forbush in his book, "Useful Birds," reaches the same conclusion. Whatever the damage may be is unimportant here; sufficient for our purpose that it is enormous. Likewise the experts have demonstrated that each of these ruthless insects has a natural enemy in the form of this or that bird. The claim very naturally follows that much of this damage can be avoided by encouraging the existence of the type of bird that feeds on the ravaging insects. The advocates of the national law declare that some states have failed to pass laws protecting such birds. For example one state protects robins and blackbirds, while another prefers to give to its inhabitants this source of food. These birds are migratory. What is the result? Protected in one state, and slaughtered in another. Any state that protects birds does so only to the advantage of another state, depriving its own citizens of this same source of food.

It "cuts its own throat" so to speak, by its own conscientiousness. This state will accordingly wipe out the prohibition, and so everywhere the law of the state with the most elastic conscience, becomes the law of all. One lenient state drags down all the others, for the laws protecting birds are competitive. So the birds die hard, and the hordes of insects go on multiplying and enjoying themselves at our expense. Up to this point there has been unanimity of opinion. From now we tread on doubtful ground.

Senator McLean, of Connecticut, believes that there must be an inherent right to protect oneself against this scourge. But where does this power lodge, in the federal or in the state branch? Senator McLean argues that the experience of 125 years, with diverse, spasmodic and crazy-quilt state laws has demonstrated their failure, and has proven conclusively that the power does not rest in the states. Their inability to efficiently protect birds and the consequent failure to reduce the insect pest, an experiment carried on for 125 years, shows that they do not possess this power. And somewhere, he contends, there must be lodged this power of self-protection. The states do not possess it; experience has so proven. There is but one alternative, the national branch. On this theory the national bird law was passed. The theory might be stated in the following form: "Whenever a particular power can not be efficiently exercised by individual state action, then that power is lodged in the federal branch. There need be no specific grant of power in the constitution, nor any implication from granted powers. The fact that diverse state action has failed proves it to be a federal power." When Senator McLean gave to the Senate the reasoning by which to uphold the constitutionality of a national bird law, to hold for migratory and insectivorous birds, the senators had great doubts; but as the reform was very necessary they passed the bill, shifting thereby a burden and possibly public criticism on the court.

A few excerpts from his speech of January 14, 1913, will state the legal reasoning by which the law is to be upheld. He said:

> My contention is that congress has the implied power as a natural and necessary attribute of its sovereignty to provide for the common defense and general welfare of the nation whenever the need is general and manifest, and the subject is such that no state, acting separately, can protect and defend itself against the threatened danger or secure to itself those benefits to which it is justly entitled as a part of the nation.
>
> If the state, by exerting its authority, can secure to its citizens the protection to which it is justly and fairly entitled, there will be no need of federal interference except as it may be complementary and at the request and with the approval of the state, but if the need for assistance is manifest, if the danger is real and general and it is not within the power of a single state to protect itself and secure the benefits and protection to which it is justly entitled, then there is, as it seems to me, no escape from the conclusion that the common defense and general welfare of the people must utterly fail unless the nation can come to the rescue.

Senator Borah declared:

> I do not think that the constitution of the United States can be construed in the light of the negligence of the states. Simply because the states neglect to use their reserved powers constitutes no reason why the national government should assume to exercise unconstitutional powers.

At another point Senator McLean said:

> I frankly said that I did not myself find authority for it [the national bird law] in any express clause of the constitution, but I thought it was one of the implied attitudes of sovereignty, based upon the incompetency of any state to accomplish the results desired, and that it is absolutely necessary that any nation worthy of the name shall have this power.

Senator McLean could cite no decision in point on this novel theory. Yet the same theory has been urged before and has been by some called the Wilson rule of construction. In 1785 James Wilson used language applicable to our constitution, though the argument was then made under the Articles of Confederation. He said:

> Though the United States in congress assembled derive from the particular states no power, juris-

diction or right which is not expressly delegated by the confederation, it does not then follow that the United States in congress have no other powers, jurisdictions or rights, than those delegated by the particular states. The United States have general rights, general powers and general obligations, not derived from any particular states taken separately; but resulting from the union of the whole. To many purposes the United States are to be considered as one undivided, independent nation; and as possessed of all rights, powers and properties by the law of nations incident to such. Whenever an object occurs, to the direction of which no particular state is competent, the management of it must, of necessity, belong to the United States in congress assembled. There are many objects of this extended nature.

In one of his speeches, after a few complimentary words for James Wilson, Mr. Roosevelt said:

He developed even before Marshall the doctrine (absolutely essential not merely to the efficiency but to the existence of this nation) that an inherent power rested in the nation outside of the enumerated powers conferred upon it by the constitution, in all cases where the object involved was beyond the power of the several states, and was a power ordinarily exercised by sovereign nations. . . . Certain judicial decisions have done just what Wilson feared; they have, as a matter of fact, left vacancies, left blanks between the limits of actual national jurisdiction over the control of the great business corporations. Actual experience has shown that the states are wholly powerless to deal with this subject [control of corporations] and any action or decision that deprives the nation of the power to deal with it simply results in leaving the corporations free to work without any effective supervision.

One might quote no end of decisions and texts declaring that Congress has only conferred and implied powers. Until this act the proposition has been regarded as settled. Therefore only one very recent case will be cited. In the case of Kansas *v.* Colorado, 206 U. S. 46, 1907, the same argument as that underlying the bird law was presented, and the court by Justice Brewer replied:

But the proposition that there are legislative powers affecting the nation, as a whole, which belong to, although not expressed in, the grant of powers, is in direct conflict with the doctrine that this is a government of enumerated powers. That this is such a government clearly appears from the constitution, independently of the amendments, for otherwise there would be an instrument granting certain specified things made operative to grant other and distinct things.

He then shows it to be conflicting with the 10th amendment, which declares:

The powers not delegated to the United States by the constitution, nor prohibited by it to the states, are reserved to the states respectively, or to the people.

This means that in the ordinary way—constitutional amendment—this new power could be thrown into the federal sphere, but in no other way can it be accomplished.

Constitutional thought then would seem to be unanimous against the validity of the McLean law, although there is "a" theory on which it might be vindicated. Public opinion is quite interested in a national bird law, and naturally hopes for a favorable decision.

What will be the effect of a decision declaring valid this new type of national powers, never before exercised. It will mean that Congress can legislate on any subject in which uniformity is desirable but impossible by diverse state action. It will open the way for a federal divorce law, a federal marriage law, a federal incorporation law, a federal insurance law, federal laws regulating hours of labor and the conditions of labor, federal laws on negotiable instruments, bills of lading, warehouse receipts, partnership, in fact the whole list of subjects which is now being urged upon the states for uniform adoption. It is conceivable too that after Congress has once legislated on such a subject, conditions may change, and uniformity become undesirable. Would it not follow then that the particular power would again be shifted to the states, and could not be constitutionally exercised by the federal branch? It is apparent that this new doctrine would virtually wipe out our whole division of powers between the state and federal branches, and would erect in its place a shifting rule depending on economic conditions. It would virtually destroy our constitution as far as the division of powers is

concerned, for there might just as well be no constitutional provision on such subjects. The courts too would have a delicate task, for they must decide whether uniformity is desirable, and second whether state action has produced an efficient result—both of which would be social, economic and political rather than legal questions; and on both of these hardly two people will agree. One can see the new field of legislation that this new theory opens up. It would make our constitution as elastic as the English constitution as far as the division of powers is concerned. It would revolutionize our whole constitutional growth. An early decision by the Supreme Court of the United States is then to be looked forward to with great interest both by the public and by students of law and government.

RAYMOND THEODORE ZILLMER

AMERICAN PHILOSOPHICAL ASSOCIATION

THE thirteenth annual meeting of the American Philosophical Association will be held at New Haven, Conn., on December 29, 30 and 31, in acceptance of the invitation of the Philosophical Department of Yale University. The sessions will begin on the afternoon of the 29th. The American Psychological Association will also meet at New Haven at the same time, and there will be one joint session of the two Associations.

The subject for consideration in this joint session is "The Standpoint and Method of Psychology." At the present time it is still uncertain whether this session will be devoted wholly to discussion of this subject, or whether a varied program will be made from among the papers offered, of a few of those that promise to be of greatest interest.

By a resolution adopted at its last meeting the Philosophical Association is this year committed to the discussion of some important problem for two sessions. This will give opportunity for both the opening papers and a subsequent adequate consideration of the subject chosen. The question selected for this main discussion is the problem of the relation of existence and value, including their relation both as facts and as concepts, and also the relation of a theory of existence to a theory of value.

E. G. SPAULDING,
Secretary

PRINCETON UNIVERSITY

AMERICAN SOCIETY OF ZOOLOGISTS

THE American Society of Zoologists, in affiliation with the American Society of Naturalists, the American Society of Anatomists and the Federation of American Societies for Experimental Biology, will hold a joint meeting of its eastern and central branches at Philadelphia from December 29 to January 1.

A joint meeting of the two branches of the Society is held this year in order that the report of the "Committee on organization and policy" may be considered and voted upon. This committee, consisting of E. G. Conklin, G. A. Drew and R. G. Harrison, representing the Eastern Branch; F. R. Lillie, M. M. Metcalf and W. A. Locy, representing the Central Branch, and the president of the society, *ex officio,* was appointed at the Princeton meeting and instructed to report at the meeting held in Cleveland. At the Cleveland meeting no report was received and the society continued the committee. On August 15, 1913, a meeting of the committee, called by Professor H. B. Ward, president of the society, was held at Woods Hole, at which a constitution for the society was outlined and agreed upon. At this meeting Drs. Lefevre, Reighard and Parker were invited to meet with the committee and take part in the deliberations, thus filling temporarily the places of members of the committee not at Woods Hole. The draft of the constitution formulated at this meeting was later sent to all the members of the original committee by the chairman, Dr. G. A. Drew, and certain changes and additions agreed upon have been made.

Since this meeting falls in eastern territory, the eastern branch will act as host, and, as required by the constitution, the officers of the eastern branch will be responsible for the program and other necessary arrangements. Members of both branches should, therefore,

send titles of papers to the secretary of the eastern branch. If possible, abstracts not exceeding two hundred words should be forwarded at the same time as the titles of papers. *In no case will abstracts be received later than the date of the final adjournment of the coming meetings.* Members are requested to indicate the group to which their papers belong in such a scheme as is here given: (1) Comparative Anatomy; (2) Embryology; (3) Cytology; (4) Genetics; (5) Comparative Physiology; (6) Ecology; (7) Miscellaneous Subjects.

The last session of the Zoologists will be held on Thursday, January 1. The meetings of the Naturalists are planned for Wednesday, December 31. The Naturalists' dinner will be given on Wednesday evening.

Caswell Grave,
Secretary Eastern Branch
Johns Hopkins University,
Baltimore, Maryland

THE SIGMA XI CONVENTION

The fifteenth convention of the society will be held at Atlanta, Georgia, on Tuesday, December 30. It is proposed that the delegates to the convention have luncheon at one o'clock, followed by the meeting for the transaction of business. In the evening there will be a dinner for members of the society and their guests.

By the rules of the society the convention is held at the time and place of the meeting of the American Association for the Advancement of Science unless otherwise provided for by the officers of the society. In view of the distance of Atlanta from the larger scientific centers, the question was submitted to the members of the council. Twenty-nine voted to meet at Atlanta, two to hold the meeting elsewhere or not at all, and three were doubtful.

There is every reason to believe that a successful meeting for the transaction of business will be held at Atlanta. Members of the council who have been influential in the development of the society have expressed their intention to be present, and it may be expected that the chapters will be adequately represented by their delegates. As the scientific programs of the American Association for the Advancement of Science and the affiliated societies will be less crowded than usual, the convention will have time to consider the important questions that will be brought before it.

DELEGATES TO THE CONVOCATION WEEK MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

At the Cleveland meeting of the American Association for the Advancement of Science, a committee was appointed to address a letter to educational institutions, government bureaus and other agencies engaged in scientific research, requesting them to send one or more delegates to the annual convocation week meetings of the American Association and the affiliated societies. This committee, which consists of Professor Charles S. Minot, chairman, Harvard Medical School; Professor J. McKeen Cattell, Columbia University, and Dr. L. O. Howard, the permanent secretary of the association, has addressed to a list of institutions the following letter:

At the meeting of the council of this Association, held in Cleveland, Ohio, on January 3, 1913, the following resolutions were adopted:

1. *Resolved:* That the Council of the American Association for the Advancement of Science requests the educational institutions, government bureaus and other agencies engaged in scientific research to send one or more delegates to the annual convocation week meetings of the Association and its affiliated societies, and that when possible the traveling expenses of the delegates be paid by the institutions which they represent.

2. *Resolved:* That a committee of three be appointed by the chair to draw up a list of institutions to which this resolution, together with a suitable letter, shall be sent by the permanent secretary.

The undersigned, in accordance with the above resolutions, were appointed as the committee called for, and we have the honor to invite your institution to send one or more delegates to the next meeting of the American Association for the Advancement of Science which will be held at Atlanta, Georgia, December 29, 1913, to January 3, 1914. We believe it will be of substantial benefit to your institution to be thus represented at our meeting. A considerable number of affiliated na-

tional scientific societies will meet together with the Association, which thus becomes a national congress, at which all the most important work and the most important problems of science and scientific education are adequately discussed. The paying of the expenses of delegates is not an innovation, as it is already the custom of several institutions, and in Europe it is the general custom, owing to the belief that the sending of official delegates to important scientific meetings is of great benefit to the institutions they represent.

Members of the association are requested by the committee to use their influence to secure the appointment of delegates from the institutions with which they are connected.

SCIENTIFIC NOTES AND NEWS

DR. BOOKER T. WASHINGTON, principal of the Tuskegee Industrial Institute, Alabama, extends a cordial invitation to the members of the American Association for the Advancement of Science and of the affiliated societies to visit the institute at the close of the Atlanta meeting.

A PORTRAIT of the late Dr. Morris Loeb, formerly professor of chemistry at New York University, was unveiled in the Gould Memorial Library at New York University on December 4. Mrs. Loeb, who presented the portrait, was present at the exercises, and Chancellor Elmer E. Brown accepted the gift in behalf of the university. Speeches of tribute to Dr. Loeb's memory were delivered by Dr. Arthur E. Hill, director of the Havemeyer chemical laboratory, of New York University, and Professor Charles Baskerville, director of the laboratory at the College of the City of New York.

THE Grashof Medal was presented to Mr. George Westinghouse at the recent meeting of the American Society of Mechanical Engineers. The medal was awarded to him last summer at the joint meeting at Leipzig of the American Society of Mechanical Engineers and the Verein Deutscher Ingenieure.

ON the evening of December 17, the faculty of Brown University will give a dinner to Professor John H. Appleton, Newport-Rogers professor of chemistry, who this year completes fifty years of service. Professor Appleton began teaching at Brown University at the unusually early age of nineteen.

DR. SHOSUKE SATO, professor and dean of the Agricultural College of the Tohoku University, has been designated as exchange professor at the American universities. He was a student of agricultural economy at Johns Hopkins University and also in Germany from 1882 to 1886.

PROFESSOR A. A. NOYES, of the Massachusetts Institute of Technology, will during the second semester of the year conduct courses and give lectures in chemistry at the Throop College of Technology, Pasadena, Cal.

MAJOR F. F. RUSSELL, formerly professor of bacteriology and pathology at the Army Medical School, Washington, D. C., has been appointed lecturer in tropical medicine at the New York Post-Graduate Medical School and Hospital. Major E. R. Whitemore, recently lecturer in tropical medicine at the Post-Graduate Medical School, has been transferred to Washington, and is now professor of bacteriology and pathology at the Army Medical School.

CAPT. J. F. SILER, of the Medical Corps of the United States Army, and Mr. A. H. Jennings, of the Bureau of Entomology, Department of Agriculture, have recently returned from the West Indies, where, in association with Dr. Louis W. Sambon, of the London School of Tropical Medicine, they have been investigating pellagra and other tropical diseases in the interests of the Thompson-McFadden Pellagra Commission of the New York Post-Graduate Medical School and Hospital.

M. JEAN PERRIN, professor of physical chemistry at the University of Paris and at present exchange professor at Columbia University, gave an illustrated lecture on December 4, on "Brownian Movement and Molecular Reality" at a joint meeting of the Washington Academy of Sciences and the Philosophical Society of Washington.

DR. MAX PLANCK has been installed as rector of the University of Berlin and gave on the

occasion an address on "New Paths of Physical Research."

Professor J. Chester Bradley, of Cornell University, addressed the New York Entomological Society on December 2 on "Collecting Insects in the Okefenoke Swamp." Professor Bradley was one of several Cornell zoologists who began a biological reconnoissance of the Okefenoke Swamp in southeastern Georgia in the summer of 1912. He again visited the swamp during the past summer, and in company with Dr. J. G. Needham will return for a short stay next month. A preliminary account of the features of the swamp in connection with a report on the ornithology of the expedition was published by Dr. A. H. Wright and Mr. F. H. Harper in the *Auk* for October, 1913.

Professor H. C. Jones, of the Johns Hopkins University, delivered an illustrated lecture on "Radium and Its Properties" Tuesday evening, December 2, before the Natural History Society of Harrisburg, Pa.

Mrs. Christine Ladd-Franklin held a conference on Color-Vision on December 6 at the Brooklyn Academy of Music.

An interesting program is already assured in connection with Section E, Geology and Geography, of the American Association for the Advancement of Science, at the approaching meeting in Atlanta. The mineral resources of the south will be fully presented by means of papers, maps and mineral exhibits by the geologists of the southern states. The program also includes papers of general geological interest. The titles and abstracts of papers to be read before Section E should be sent at once to Professor George F. Kay, Iowa City, Iowa.

The power schooner *Mary Sachs,* one of the boats of Mr. Vilhjalmar Stefansson's Canadian Arctic exploring expedition, has been wrecked in the ice off the Arctic coast of Alaska. The ice crushed the schooner and all the provisions and scientific instruments were lost. The *Mary Sachs* was purchased at Nome by Mr. Stefansson for use of the southern party of the Canadian expedition, which also has the power schooner *Alaska.* Dr. R. M. Anderson, commanding the southern party, is aboard the *Alaska,* and Mr. Kenneth Chipman, the geologist, was placed in command of the *Mary Sachs.* The last previous report received from the expedition was carried by messenger to Circle City, Alaska, arriving there November 10. The messenger reported the *Mary Sachs* and the *Alaska* ice-bound at Collinson Point, Alaska, one hundred miles west of the international boundary. The *Mary Sachs* was a gasoline schooner of 350 tons gross register. She carried a crew of three men. The southern party was to have made a scientific exploration of Victoria Land and Banks Land, while Mr. Stefansson on the *Karluk* explored the unmapped region in Beauford Sea.

The American National Red Cross announces the receipt of gifts of $100,000 each from Mr. Jacob H. Schiff and Mr. James A. Scrymser, and of $2,000 from Mrs. Whitelaw Reid. The gift from Mr. Scrymser is to be added to the fund for the purchase of land in Washington on which the government is to erect a building for the Red Cross as a memorial to the women of the Civil War. Congress has already appropriated the sum of $400,000 to cover the cost of constructing the building, and the Red Cross has offered to raise the $300,000 necessary for the purchase of the land.

Closer union between the state board of health and Ohio State University and its departments of instruction is contemplated in the proposal to move the state laboratories to the university campus. A detention hospital for the wards of the state will also be built there and public health conserved by university service. The proposition was endorsed at a recent meeting by the board of administration, the state university trustees and Governor Cox. It is believed that the plan will reduce the expense of operating the state board of health laboratories, afford practical work for students in the preparation of serums and the making of experiments, and enlarge the efficiency of the state in its relation to public health. Governor Cox also endorses

the proposal to move the state library to the campus.

THE daily life of the ancient cliff dwellers is exhibited in the new permanent "Southwestern Indian Hall" just added to the museum of anthropology of the University of California, in San Francisco. Two other phases of aboriginal life are abundantly illustrated in the same new hall—the town-dwelling arts, crafts, rites and industries of the Pueblo Indians, and the life of war and the chase led by the nomadic tribes of the Southwest, such as the wild Apaches, Navajos, Pimas, Papagos and Walapais. The museum is open free to the public daily except Monday, with free lectures every Sunday at 3. It has four other large permanent exhibition halls—Egyptian, Greek, Peruvian and Californian—besides smaller unit collections. The collections of this museum of anthropology are said to be worth from three to five million dollars. They are the gift to the university of Mrs. Phoebe A. Hearst. The department of anthropology is extending its usefulness by field investigations of Indian languages and customs, by correspondence courses in anthropology, and by sending out to any school that desires traveling loan collections illustrating life among the Indians.

AT the meeting of the Academy of Natural Sciences of Philadelphia, held the 2d inst., the following was unanimously adopted:

WHEREAS, The academy has been informed by the council of the receipt and adoption of a final report on the centenary celebration and the discharge of the committee having charge of it,

Resolved, That the academy, approving of the action of the council, desires to express its obligation to the committee and to record on the minutes its thanks for the entirely adequate and satisfactory discharge of its duties, resulting in a record of achievement which can not fail to be an incentive to those who will celebrate the second centenary of the academy in 2012.

BULLETIN 539 of the Harvard College Observatory, signed by Dr. Edward C. Pickering, the director, states that Titan, the brightest satellite of Saturn, has been found to be variable from a discussion of observations taken on 60 nights by the late Oliver C. Wendell. The measurements were made with the 15-inch equatorial as described in H.A. 69, Part 1. The light varies regularly from 8.53 to 8.77, when reduced to mean opposition. The average deviation of twelve groups from a smooth curve is ± 0.023. The period as in the case of the eighth satellite, Japetus, is the same as that of revolution. Accordingly, it is probably due, in both cases, to one side of the satellite being darker than the other. Titan is fainter than its mean brightness for only about one third of the time. The minimum occurs near the times of superior conjunction. From similar observations, on 96 nights, Japetus was found to vary from 10.40 to 12.18. The maximum brightness occurs very near the western elongation.

THE study of protective coatings for iron and steel, begun by the American Society for Testing Materials in 1903 and continued unbrokenly and with increasing effectiveness to the present time, is described in detail in the reports of Committee E (now Committee D-1), now published in combined form in a single volume by the American Society for Testing Materials. During the first few years of the committee's work, it had more or less to feel its ground, but as soon as definite lines of work became clear to it, this work was taken up and pushed as vigorously as possible, consistent with the exercise of conservative judgment. The first constructive work the committee undertook was in the application of nineteen different paints on the Havre de Grace bridge in 1906. Since then a great deal of work has been accomplished in the study of white paints, the influence of pigments upon corrosion, linseed oil, soya bean oil, China wood oil, turpentine, definitions of terms used in paint specifications, etc. There is probably no book which contains within its covers so much original work on the subject of paints. Committee D-1, approximately made up, as it is, half of representatives of producing interests, and half of representatives of consuming interests, constitutes a body of investigators, unhampered as to any line of investigation it

may take up, but conservative as to the conclusions it draws. The volume is arranged chronologically, and the contents give full information as to where the reports of the various subcommittees appear. These reports contain numerous tables giving analyses and classifications of paint materials.

UNIVERSITY AND EDUCATIONAL NEWS

At the meeting of the National Association of State Universities, which was held recently in Washington, D. C., a committee was appointed to draw up plans and policies to be submitted to congress for its approval. A bill will be presented asking for $500,000 as the first step in the organization.

A fund of $500,000, which the Knights of Columbus of this country have been collecting for more than two years for the Catholic University at Washington, has been completed. The gift, it is understood, will be presented to the institution some time during the Christmas holidays.

The board of regents of the University of California has announced the completion of the additional fund of $600,000 for the erection of the hospital building which is to be a part of the College of Medicine of the university. It is stated that the principal donations to the fund are from Mr. and Mrs. William H. Crocker, Templeton Crocker and Mrs. C. B. Alexander, New York, who contributed $150,000, and Mr. John Keith who also gave $150,000. A committee has been appointed to administer the fund and supervise the erection of the building.

The library of the late Dr. Ernest Ziegler, professor of pathology at Frieburg, founder of the *Beiträge zur Pathologische Anatomie* and author of the well-known text-book on pathology, was presented formally to the medical department of the University of Pittsburgh on December 4. The donor is Mr. Richard B. Mellon of Pittsburgh.

Faculty promotions at Oberlin for the coming year include: Robert A. Budington, associate professor of zoology, to be professor of zoology and head of the department; Dr. George R. M. Wells, instructor in psychology, to be associate professor; Dr. S. P. Nichols, as associate professor of zoology. New appointments include: Dr. Charles G. Rodgers, to be professor of zoology. Dr. Rodgers's academic record is as follows: A.B., Syracuse University, 1897; A.M., Syracuse, 1899; Ph.D., California, 1904; instructor in zoology, Syracuse, 1899–1902; assistant professor, 1905–07; associate professor, 1907–11, and professor since 1911.

New members of the staff of instruction of the Throop College of Technology are Franklin Thomas, B.E., Iowa, associate professor of civil engineering, and Howard J. Lucas, B.A., Ohio State University, M.A., Chicago, instructor in chemistry in place of Charles A. Brautlecht, resigned. Professor Thomas has done graduate work at McGill University and has been a member of the engineering staff at Michigan. He has also had practical experience.

DISCUSSION AND CORRESPONDENCE

MORE DATA ON THE HISTORY OF THE DOLLAR MARK

Private correspondence carried on since the publication of my article on the evolution of the dollar mark in the *Popular Science Monthly* for December, 1912, has brought to my attention some new material and a few minor corrections, which seem worthy of publication. I may say at the outset that the new material does not modify the conclusion I had reached, viz., that the modern dollar mark descended from p^s, the Spanish-American abbreviation for "pesos." As a first correction, my former statement that in Argentina, $ is placed after the numerals, thus 65 should be modified by inserting "usually" or "frequently." In the newspaper *La Prensa*, published in Buenos Aires, the $ usually follows the numerals in the short advertisements, but usually precedes the numerals when they are arranged in columns. Again, I said that the $ occurred in the Hawaiian edition of 1845 of Warren Colburn's "Mental Arithmetic," but the corresponding secretary of the Hawaiian Historical Society kindly informs me that the

edition of 1835 contains the $ and that there was a still earlier edition which he had not seen. I had stated that, in 1802, William A. Washington used the $; Mr. E. Tobitt, of the Omaha Public Library, informs me that an original ledger of George Washington himself, owned by the library, contains the $ frequently. The earliest date of the ledger is January 1, 1799. It would be interesting to receive reports about older Washington ledgers on this point.

Of value, by way of corroboration of our conclusions, is the following quotation from a letter of Professor H. E. Bolton, of the University of California. He says:

> I see that your conclusion is just what mine was, with the difference that yours is based upon wide research, in different languages, while mine was based upon incidental observations in connection with work on Spanish manuscripts.

Most interesting information relating to the early use of the dollar mark is contained in a letter which I received recently from Mr. Augustus H. Fiske, of Cambridge, Mass. Mr. Fiske points out that the modern dollar mark occurs in a diary of Ezra L'Hommedieu for the year 1776. This date is two years earlier than the earliest occurrence of the modern dollar mark that is mentioned in my article in the *Popular Science Monthly*. Mr. L'Hommedieu was a native of Southold, Long Island. After graduating from Yale he practised law in New York City. He was a member of the New York Provincial Assembly which, on July 10, 1776, styled itself the Convention of the Representatives of the State of New York. During a portion of his service he kept a diary stating what took place in the assembly. This is still in the possession of his descendants. The first date mentioned in the diary is June 10, 1776. It ends abruptly on December 5, 1776.

Before August 21, 1776, most of the sums of money mentioned in the diary are expressed in pounds and shillings. When dollars are mentioned, the word "dollars" is written out in full. On August 21 occurs the first use of the dollar mark in the diary (see tracing 1). I quote the following from Mr. Fiske's letter:

> The item reads, Treasurer to advance to Capt. Wisner $580 for bounty. On P. M. Aug. 24th. Hugh Doyle is to receive 8 dollars. Here the word is spelled out once more. Meanwhile English money continues in other items. Under date of A. M. Aug. 28th. the treasurer is to advance $10 for removing military stores from N. Y. Here we have the second occurrence of the $ sign (tracing 2).
>
> During the next few weeks appropriations in dollars become more frequent, though the English money still predominates and the dollars are still spelled out. On A. M. Octr. 2d, a loan of $100,000 is obtained from the Continental Congress (tracing 3), and on Oct. 3d and 4th the same sum is referred to in a similar way (tracings 4 and 5). On the latter date the treasurer is also to pay $6412 2/3 bounty money to the rangers (tracing 6). The $ sign now appears more frequently. On Octr 11th both A. M. and P. M. it appears in reference to the loan of $100,000 and an advance of $200 to the troops of Orange County (tracings 7 and 8); and the $100,000 again appears on Octr. 14th A. M. (tracing 9).
>
> Meanwhile references to English money continue, but only one to dollars, written out, on A. M. Oct 15th. That same day $10,000 was appropriated to buy clothing for the troops (tracing 10), and the next morning $100 was given to encourage the manufacture of flax (tracing 11).
>
> The next two weeks contain fourteen items of

> English money and it is not till P. M. Octr. 31st that Uriah Mitchell applies for cash on account of wages as a daily rider and received $100 on account (tracing 12). The appropriation was approved the next morning and referred to as $100 (tracing 13). English money is now referred to until P. M. Nov. 9th when E. Benson Esqr., is to

apply to the General Court of New Hampshire for $1000 (tracing 14). Thereafter until the end of the book the money is all in English pounds.

We see in the above the gradual substitution of the conventional $ sign for the spelled word. The spelling out of the word becomes less and less frequent as the record proceeds. If we examine the tracings of the signs, we find that the first eleven have the S crossed by only one line. The last three have the double line as it is used at the present day.

Florian Cajori

Colorado College,
Colorado Springs, Colo.

A NON-CHROMATIC REGION IN THE SPECTRUM FOR BEES

To the Editor of Science: The brilliant work of Professor K. v. Frisch, of Munich, on the color sense of bees (which follows upon his very ingenious investigation of the color sense of fishes and of crabs) seems to have been strangely overlooked in this country, where more confidence is placed in the very insufficient (from the point of view of logic) conclusions of Hess than they deserve. v. Frisch carried on his experiments on bees in the open air, in the close vicinity of an aviary; he found that a single day's training was sufficient to enable many hundreds of bees to form the association: Whatever is blue is sweet, whatever is gray (of any one of thirty-two different shades) is not sweet. In the same way they were able to learn, later, that yellow indicates sweetness; no amount of training, however (they were tried steadily for ten successive days), could teach them to distinguish between red and black. Training for green had to be postponed for another year, on account of the oncoming of the cold and rainy weather of autumn, which rendered the bees too sluggish to carry on the work.

Professor v. Frisch's results are so striking, especially the proof of the total blindness to red of his bees (shown already by Washburn and by Watson in the case of higher animals), and his method (which I do not give here) was so good—so convincing and so little consumptive of time—that I was anxious to have him, when the weather permitted, put to the test a question which had been in my mind for some time, namely, whether, when animals are insensitive to red, there can not be found a certain blue-green (its complementary color) to which they are also insensitive—whether they have not, in other words, a dichromatic (yellow and blue) color system only. I therefore wrote to Professor v. Frisch some three weeks ago on this point, and I have now received a reply from him. He writes me that he has already tried the experiment, and that my *Vermuthung* is justified. There is a completely non-chromatic region for the bee in that part of the color-spectrum which corresponds to blue-green for the normal eye: no amount of training enabled the bees to pick out this color from the series of grays, although, as I have said, a single day sufficed to train them to alight, in hundreds, on yellow, or on blue, and to leave the grays entirely unvisited. This, combined with the fact that the point of maximum brightness for bees is shifted well towards the green (the circumstance which led Hess to the erroneous conclusion that bees, as well as all other invertebrates together with fishes, are insensitive to chroma—that they have achromatic vision only) shows in fact that their vision is dichromatic instead of tetrachromatic, that their colors are yellow and blue, and that their vision resembles in type the protanopic form of red-green blindness.

That this quite extraordinary fact—the non-specific quality to bees (as well as to fishes) of the blue-greens—has not hitherto been discovered by the investigators of the color sense of animals is easy to understand, for, since one can not readily try all the colors of the rainbow, one naturally tries first the "unitary" colors, red, green, yellow and blue, instead of the "color-blends," blue-green, yellow-green, red-yellow and red-blue (the two last are popularly but most unscientifically called orange and purple, respectively). One forgets, what ought to be a perfectly familiar fact, and would be were it not for the innumerable color-illusions which the Hering color-theory forces upon its adherents, that though the red-green blind individual never

gets the sensation *green,* it is not the chlorogenic light-rays (*i. e.,* those which produce for us the pure green sensation) that are achromatic to him, but that it is exactly the "blue-green"-producing light-ray region to which he is wholly chroma-blind. This is a hard saying for the adherent of the Hering theory: one of the many logical *voltes-face* which he is obliged to perform, in order to follow his leader, is to believe at one moment that red and green are complementary colors (which every kindergarten child knows they are not),[1] and to admit at the next moment that the mid-spectrum region which gives an "achroma"-sensation to the partially color-blind is not green but blue-green. This latter fact demands (and receives) countless most complicated purely *ad hoc* hypotheses by way of explanation on the part of the adherents of Hering (or so many of them as have recognized its damaging character).[2] In my color theory[3] this fact is a matter of course—it is one of the facts which the theory was devised for the purpose of taking account of.

Our shockingly inadequate color-language does not readily permit us to state—and hence still less to remember—that objective light-rays of a given periodicity are not in themselves, *e. g.,* "green," but only a cause of a green sensation, in a normal eye, after their effect on the retina has been transmitted to the cortex. What looks pure[4] green to a person with normal vision will look pure yellow to the partially color blind, with equal justification—a fact which is quite destructive to the Hering theory. We have here good proof that it is important to have a reasonable color-theory in the back of one's mind, or at least not to have an unreasonable one. Those who maintain that color-theories are, in the present stage of our knowledge, of no consequence are those who are nevertheless, subconsciously, fully dominated by the Hering theory. They will tell you, for example, that the brightness of the most brilliant of reds is wholly due to its whiteness, quite as if they were making, not a wildly improbable theoretical statement, but a plain statement of fact. One of them said to me lately, "But I can not think of red and green as anything but complementary colors!" No physicist, of course, can give a moment's attention to a theory which flies in the face of fact to this extent. On the other hand, the open-mindedness to psychological considerations which the physicist is sure to develop some time is already evidenced in a phrase lately dropped by Robert Wood (in his wonderful book on "Physical Optics"); he speaks of an even red and green light-mixture as producing "subjective yellow." This is probably the first time that any physicist has ever found occasion to admit that though red, green and blue spectral lights, if mixed, will furnish matches for all the intervening colors of the spectrum, it still needs to be explained that the series matched by the red-greens contains, for sensation, no trace of red-greenness. Helmholtz himself said that the yellowness of red-green, and the whiteness of red-green-blue were quite immaterial circumstances.

J. B. and M. L. Watson, reporting on their work on the specific light response of some rodents, in which they seemed to find that the rat does not discriminate between red and green, nor between blue and yellow, say: "To the adherents of color theories the denial of a response based upon wave-length, in the case of red and green, and in the case of blue and yellow, is the equivalent of denying the possibility of a response on the basis of wave-length anywhere in the animal's spectrum." But this view is an indication that all theories look alike to them. On my theory, which was devised for the purpose of taking account of the *facts* of

[1] Hering himself has explained to me that color does not mean much, because colors vary so with the illumination!

[2] See G. E. Müller in the *Zeitschrift für Psychologie,* Bd. XIV., and passim.

[3] See Baldwin's "Dictionary of Philosophy and Psychology," Art. Vision, and the "Psychology" of Professor Calkins, who has now relegated both Helmholtz and Hering to an appendix. My theory has lately been appropriated by F. Schenck. v. Brücke, *Zntrlb. f. Physiologie,* 20, No. 23.

[4] That one can perfectly well form this judgment "imitary color," "color-blend," has lately been shown by Westphal, *Ztsch. f. Psychol.* (1), 44, p. 182, 1909.

color vision, it is exactly an even blue-green, which looks to the yellow-blue visioned individual achromatic. In this case, of course, there was no occasion for trying blue-green, since the rats could not be shown to have any color sense at all—a result which there are several reasons for having anticipated. Nevertheless, it remains true—what v. Frisch's discovery confirms—that you can not, as a matter of fact (nor in my theory), draw simple inferences from the unitary colors to the color-blends.

Professor v. Frisch has sent me specimens of the blue-greens to the chroma-quality of which his bees are insensitive; I should be glad to share them with any one who can proceed to test the blue-green sense of any animals which are already known to be blind to red.

Christine Ladd-Franklin
Columbia University,
November 7, 1913

Notes on a Chestnut-tree Insect

While in the employ of the Pennsylvania Chestnut Tree Blight Commission, last winter, my attention was called to numerous burrows almost always present in the bark of the chestnut tree, particularly in the smooth-barked trees. These are the burrows that Metcalf and Collins referred to in the U. S. Farmers' Bulletin, No. 467, as the work of *Agrilus bilineatus*. As we were sure the burrows were not made by this species, the commission force referred to the insect maker as the *Bast Miner*. Not much was accomplished on the study of this insect until the spring season advanced. Then much effort was directed to the solving of the life-history of this insect and what relation it bore to *Endothia parasitica*. When the work stopped in July, the life-history was nearing completion, and a number of experiments were in progress which would have given some interesting results. A detailed account of the description of the larva and its work, etc., was prepared for publication, but the only adult obtained was injured irreparably and probably can not be named. Because the adult insect emerged after July 1 (the time of my leaving Pennsylvania), it has been impossible to work out the egg-laying habits. The larvæ hibernate in the burrows in either the second or third instar. During the winter months they are inactive, but, as soon as spring opens, activity commences. When finished, the burrow is not very extensive, the longest not being more than six inches and extending longitudinally. In width, it extends only over a very short distance.

While the insect is living within the trees, the burrow can not be detected externally. After the emergence of the larvæ, however, the bark swells over the burrow, often cracking and making a conspicuous wound. The larvæ leave the trees during the first part of June through minute exit holes, dropping to the soil, in which they spin a seed-pod-like cocoon, characteristic of some of the Microlepidoptera.

Under insectary conditions, the adult insect emerges during August. The injured specimen was sent to Mr. W. D. Kearfott, but of course could not be named.

The number of exit holes made by these insect larvæ is enormous in any given area of chestnut forest and as these holes are made just at the time of year that the blight spores are very abundant, and conditions generally are favorable for their development, it is believed that this species of insect has an important bearing upon the spread of *Endothia parasitica*.

A. G. Ruggles
University of Minnesota,
November 10, 1913

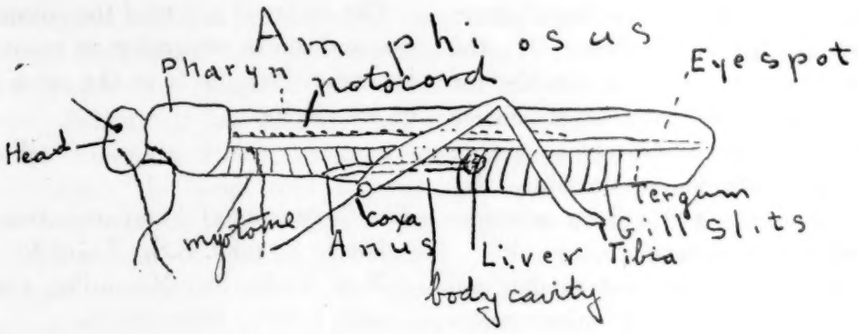
A Connecting Type?

An illustration of how completely a student may become confused in a written examination is shown in the accompanying figure, which is an exact tracing, somewhat reduced, of the figure drawn by a freshman in an examination in elementary zoology.

The question was to make a sketch, from memory, of course, of the anatomy of *Amphioxus*, as seen in lateral view.

At first glance the sketch appears to be a fairly good representation of a lateral view of

a grasshopper; but more careful examination will show that there are various parts of *Amphioxus* mixed into the grasshopper in a most remarkable way. These structures are so inconspicuous in themselves that they might have escaped notice if they had not been so plainly indexed, and if the question had been upon the anatomy of the grasshopper instead of the other animal.



That the figure was not drawn as a joke seems evident from the fact that the student failed to pass the examination, and would not, of course, take the chance of having one question thrown out completely. Perhaps the joke is on the instructor, after all.

A. M. REESE

SCIENTIFIC BOOKS

The Early Naturalists: Their Lives and Work (1530–1789). By L. C. MIALL, D.Sc., F.R.S. London, Macmillan & Co. 1912.

This book, by a practical naturalist of honorable attainment in the field of research, is a useful book of reference. It has the merit of being written from a thorough examination of the original sources and is a work of great industry and patience. It covers the period from 1530 to 1789 during which the sciences of organic nature were in the process of making. Many of the contributions of the time were mixed, and, taken together, they are more in the nature of vague foreshadowings of what was to come rather than specific additions to any science that had already taken definite form. This circumstance makes it most difficult to convey to the general reader a unified picture of progress, and it is to be said that the book is not dominated by the conception that, notwithstanding details, there is a clear path of advancement in biological thought.

The preface, and his estimate of some of the more prominent men, indicate that the author had this conception in mind, but it is not clearly carried out. The observations of capital importance are not separated from those of subordinate interest, nor are the chief results of investigation sufficiently emphasized to exalt them above those of secondary significance.

In its method the book is analytical rather than synthetic, and does not exhibit the selective and combining power that is necessary to convert the details into a lucid story of progress. Dr. Miall gives, with thoroughness and accuracy, summaries of the researches of the naturalists of the period and of their views on a variety of questions. His volume is a compendious reference rather than an illuminating treatment of tendencies and currents of thought, and seems, to the reviewer, to be of greater service to the naturalist than to the general reader.

His section on "The Minute Anatomists" is the most interesting and the best assimilated part of the book. Here, the author writes with an evident command of the subject, as might be presumed from his familiarity with insect anatomy, as well as his excellent account of Malpighi, Swammerdam and other devotees of minute anatomy, in Miall and Denny's "The Cockroach."

The title "The New Biology" for the first section of the book is suggestive and inviting, but it does not appear to be a happily chosen

title for the period covered—from 1530 to about 1603. The reader is likely to dissent from the inference that the work of Brunfels, Fuchs, Gesner and others constitutes the "new biology" which was more properly the product of the nineteenth century. Nevertheless, his account of the naturalists of this period is very interesting. In the works of Brunfels and Fuchs we find recognition of the practical utility of *affinities* for the systematic arrangement of plants, as well as sketches from nature published before the appearance of the "Fabrica" of Vesalius. This is notable, for there was little objective treatment of science at this time, and few sketches from nature before those prepared under Vesalius, the drawings of Leonardo da Vinci on anatomy being the most notable exceptions.

There are some omissions not readily accounted for. For illustration, one misses reference to the work and the great influence of Vesalius, Harvey, Spallanzani, and the Hunters. These men lived in the period under consideration and, judged in the light of their influence on the developing science of biology, they were founders in as large a sense as any others mentioned. The work of Vesalius served to open the field of morphological studies, and that of Harvey to introduce experimental observation into biological science. While Vesalius might possibly be ruled out, on the ground that his observations were not broadly morphological but applied chiefly to the human body, this is not the case of Harvey, who was not only physiologist but comparative anatomist and observer in embryology as well. Harvey is incidentally mentioned in connection with the embryological work of Malpighi, but his influence was great enough to make him worthy of separate treatment. Spallanzani and John Hunter were naturalists in a broad sense and deserving of representation. Probably Haller should also have some mention.

There are in the book many evidences of ripe scholarship and extensive learning, with an unusually limited number of mistakes. In the section on "Early Studies in Comparative Anatomy" it is probably an error to designate the Essay on Comparative Anatomy of Alexander Munro primus as the earliest formal treatment on the subject. The "Zootomia Democritæ" of Severinus, published a century earlier (1645), is a more likely competitor for this distinction.

It is to be regretted that there are no illustrations in the volume. Portraits of the more notable observers and illustrations selected from their numerous plates would have added greatly to the interest of the book.

The reviewer has read the volume with interest, and while venturing to point out some of its limitations, he is at the same time sensible of its merits.

Wm. A. Locy

The Chemistry of Plant and Animal Life. By Harry Snyder, B.S. Third Revised Edition. New York, The Macmillan Company. Pp. xxii + 388. Price $1.50.

The scope of this little volume is in some respects even wider, in others considerably narrower, than its title would lead one to expect. Of the two parts into which it is divided the first, comprising about two fifths of the text, constitutes a brief introductory course in general chemistry, presenting in elementary fashion the fundamental concepts and laws of the science, and reviewing those elements and simple compounds that from an agricultural standpoint are the most important. The second deals with certain selected phases of biochemical science, such as the characteristic organic compounds of plants and animals, the chemistry of plant growth, the composition of cereals and coarse fodders, the chemistry of digestion and nutrition, and the rational feeding of animals and men. Nearly every chapter contains, besides its expository paragraphs, a number of appropriate problems and laboratory exercises. The whole "is the outgrowth of instruction in chemistry given in the school of agriculture of the University of Minnesota."

The book is, of course, hardly more than a primer, and from a primer much that is interesting and even important must be rigidly excluded. On the other hand, the process of elimination may be pushed too far; and the

reviewer may be permitted to doubt whether the most elementary treatment of the chemistry of life can, for instance, afford to neglect such substances as the amino-acids, or to omit from its vocabulary the word "metabolism." The fact that amino-acids appear sometimes to be vaguely referred to among the "amides" does not diminish the seriousness of the first defect; nor is the second excused by the author's peculiar use of the word "digestion." Digestion, it would seem, is employed to signify not merely the preparation of food for its absorption, but also its subsequent fate within the organism. When this has been grasped it is possible to understand such remarkable statements as that "in order that digestion may proceed in a normal way, a liberal supply of air is necessary to oxidize the nutrients," or that when carbohydrates are "completely digested, carbon dioxide and water are the final products," or that "during . . . digestion, heat is produced in proportion to the calories contained in the food . . . digested."

In discussing the "Nitrogenous Compounds of Plants" the author retains the term "proteid," now generally abandoned by English-speaking chemists. He classifies casein as an "albuminate," vitellin as a "globulin-like body," nuclein and mucin as "albuminoids." The system of protein nomenclature adopted by the American Society of Biological Chemists and the American Physiological Society receives, indeed, no recognition whatever. The doctrine of ferments and fermentation is another theme that might with advantage have been cast in a more modern form. The concept of a ferment does not to-day include such things as the "tubercular organism," and the once important distinction between "organized" and "soluble" ferments has now little more than a historical interest. It is to be regretted that a "revised edition" should perpetuate terminologies and methods of presentation that, to say the least, are obsolescent.

If the weight of these criticisms be allowed to depend to some extent upon the individual point of view, it is otherwise with the actual misstatements that are occasionally encountered. Some of these, to be sure, are mere slips, as when nitrogen is said to constitute "23 per cent." of the atmosphere; others argue chiefly a lack of precision, as when carbon is said to be "present in plant and animal bodies in larger amounts than any other element." But there are several positive blunders. Wax is stated to contain "an ethyl radical in place of the glycerol radical" of fat. The globulin of wheat is called "edestin." Meat is described as containing 0.07 to 0.32 per cent. of an "amide," which bears the name of "keratin." It is obvious enough what substance is being spoken of; but the name is not apparently a simple misprint, for it is thrice employed in one paragraph, and is to be found unaltered in the index.

In spite of the blemishes noted, the book, as a whole, is capable of filling a useful place, and there are many sections which deserve ungrudging commendation. This is especially true of the chapters dealing with the various important food crops, and with their application to the scientific feeding of animals and men. Here the author, speaking often as a first-hand authority, makes a discriminating selection of essential facts, and presents them in a manner at once accurate, lucid and interesting. Many tables of useful data are incorporated, and excellent diagrams illustrate graphically the comparative composition of important foods.

The reviewer can not approve the construction of a sentence like the following: "Iron . . . readily undergoes oxidation and rusting, due to the joint action of oxygen and water, and results in the production of a basic oxid of iron." Fortunately such lapses are infrequent, and the style of the book is in the main straightforward and readable.

ANDREW HUNTER

CORNELL UNIVERSITY

Household Bacteriology. By ESTELLE D. BUCHANAN, M.S., Recently Assistant Professor of Botany, Iowa State College, and ROBERT EARLE BUCHANAN, Ph.D., Professor of Bacteriology, Iowa State College and Bacteriologist of the Iowa Agricultural

Experiment Station. The Macmillan Company. Cloth, 8vo. xv + 536 pp., index. $2.25 net.

During the last decade, the science of household bacteriology has made very wonderful progress as an independent study and as a result we feel to-day a very clear and constant demand for suitable text-books and manuals for use in this new but important field of bacteriology.

The book as presented by the Buchanans consists of a neatly bound volume of 536 pages clearly but simply written. The text is profusely illustrated by original drawings and photographs which add greatly to the attractiveness and usefulness of the book.

"The volume has been divided somewhat arbitrarily into five sections," by the authors. The first three chapters are of an introductory nature and cover the general topic of bacteriological technique. In Section II. more emphasis ought to have been laid on standard methods for the preparation of culture media and more space should have been allotted to the discussion of the cultural characteristics of the yeasts and molds.

Section IV. is given over to fermentation or zymotechnique, as it is called by the authors, and is the best chapter of the book. This section consists of 114 pages and covers the subject of enzymes and their fermentative activities and is characterized by its clear descriptions and explanations of this most complex but interesting subject. The book closes with a section entitled "Microorganisms and Health," consisting of a general discussion of the theory of disease followed by a detailed description of the pathogenic bacteria yeasts and molds. The chapters of this section dealing with the examination of air, water and food might have been elaborated upon and formed into a new section. The volume is supplemented by an appendix containing a key (37 pages) to the families and genera of the common molds which is fully illustrated and must be very useful as a ready means of identifying the common molds of the laboratory.

The main criticism of this volume lies in the title "Household Bacteriology." It is inadequate for two reasons. The book in its present form is too broad to be called a bacteriology and should have been called a microbiology or by some other suitable title. The authors have realized this narrowness of title by using the term microorganism in the heading of every section. Then again this volume is merely a general bacteriology whose title has been extended to cover the field of household bacteriology. With the exception of the poor choice of title, the volume is well written and well adapted for courses in general bacteriology.

William W. Browne
The College of the City of New York

Elements of Water Bacteriology. By Professor S. C. Prescott and Professor C. E. A. Winslow.

Prescott and Winslow's "Water Bacteriology" is the best known book on the subject in America, and it may also be added that it is the best book. This third edition has been entirely rewritten and very much enlarged. The authors state that the revision has been made necessary by the newer ideas on the effect of temperature upon the viability of bacteria in water, the new methods of isolation of specific pathogenic organisms, and the recent recommendations of the Committee on Standard Methods of Water Analysis of the American Public Health Association. The authors do not approve of the recent recommendation of this committee to replace the 20 deg. gelatine count by the 37 deg. agar count. This recommendation has received unfavorable comment at the hands of many American bacteriologists, and has resulted in producing an unfortunate condition of confusion. The authors hold that both the 20 deg. gelatine count and the 37 deg. agar count should be used, and this idea was approved by the Laboratory Section of the American Public Health Association in 1912.

The authors also take issue with the Standard Methods Committee on the subject of the test for *B. coli.* The discussion is too long to be referred to in this review, but it is one of great interest and importance to every bacteriologist and sanitary engineer, and should be

carefully studied. In general, it may be said that the authors hold that fermentation of lactose broth, or lactose bile, may be regarded as a sufficient working test for organisms of intestinal origin. If this idea is carried out it will greatly simplify the routine procedure in the examination of water. The work of the English bacteriologists is discussed at length, particularly that of Houston in London and Clemesha in India.

A new chapter has been added to the book on the bacteriological examination of shell-fish, and it includes the recommendation of the Committee on Standard Methods for the Bacteriological Examination of Shell-fish of the American Public Health Association. The appendix describes the preparation of culture media, and contains an excellent list of references.

GEORGE C. WHIPPLE

SPECIAL ARTICLES

THE CHESTNUT BARK DISEASE ON CHESTNUT FRUITS[1]

SINCE the chestnut bark disease has been so widely studied by the many investigators who have given attention to it within the last few years, numerous articles have been published calling attention to the various ways by which the infection is known definitely to be spread from place to place, as well as of some methods that have been assumed to contribute to its spread. The most prominent of those thus far mentioned have been due to the transportation of spores through the agencies of wind, rain, insects, birds, rodents, man, etc., or to the transportation of various fruiting and vegetative parts, or fragments of the fungus, by means of infected cordwood, poles, ties, bark, grafting scions, nursery stock, etc. So far as the writer knows, no one has called special attention to the danger of the disease being transmitted by means of infected chestnut fruits, yet infected nuts at times undoubtedly are capable of spreading the disease, as will be realized from what follows, which describes one case which has come to our notice.

[1] Published by permission of the Secretary of Agriculture.

In September, 1912, Professor R. Kent Beattie, Dr. T. C. Merrill and the writer found numerous nuts and burs, which had been lying on the ground in Lancaster county, Pennsylvania, for several months, upon which were many reddish brown pustules, in a buff or yellowish mycelium. These looked very much like the pycnidial pustules and mycelium of *Endothia parasitica*. Portions of the diseased fruits were inoculated by the writer into the bark of a grafted Paragon chestnut tree, while for comparison some inoculations were made at the same time from a typical canker. The infected nuts were collected on September 4, 1912, and the infected bark was collected and the inoculations made on the following day. The records and results of these inoculations are given below.

The limb selected for inoculation was healthy-looking, apparently free from disease, from one to two inches in diameter, but on a tree that was already diseased on some other limbs. Eighteen cuts through the bark were made with a sterile knife-blade, except as noted below in the case of two cuts. For convenience in referring to these cuts they have been numbered consecutively from 1 to 18. Nos. 1, 2, 5, 6, 7, 8, 11, 12, 13, 14, 17 and 18 were checks, all uninoculated in the ordinary sense, though cuts 13 and 14 were made with the knife-blade after it had been used to cut some of the infected bark to be inserted in cuts 15 and 16.

Cuts 3 and 4 were inoculated with pieces of the mycelium-covered shell of the nut after the pustules had been cut away; cuts 9 and 10 were inoculated with pieces of the shell to which pustules were still attached; and cuts 15 and 16 were inoculated with pieces of bark from a disease lesion on the bark of an American chestnut tree.

On July 22, 1913 (about ten and one half months after the inoculations were made), the inoculations and checks were reexamined and records made of their condition. Cuts 1 and 2 were uninfected. Cut 3 likewise was uninfected. Cut 4 had developed a characteristic lesion about 4 inches long. Cut 5 was sur-

rounded by disease, apparently from two confluent lesions, one of which started about midway between cuts 4 and 5, but on the opposite side of the limb, while the other started near cut 5 and on the same side of the limb. Judging only from the size of these lesions, they must have originated soon after the inoculations were made. There was no evidence that any infection had started at cut 5. Cut 6 was uninfected. Cuts 7 and 8 showed sunken areas but no fans, pustules, nor other symptoms of the disease. Cut 9 had developed a girdling lesion 7 inches long with very many pustules. Cut 10 had developed a lesion 4½ inches long and 3 inches wide. Cuts 11, 12, 13 and 14 were uninfected. Cuts 15 and 16 had produced confluent girdling lesions aggregating 11 inches in length. This probably indicated that each cut had produced a lesion about 6 inches in length, as the cuts were about 5 inches apart. Cuts 17 and 18 were uninfected.

The results of these inoculations may briefly be summarized as follows:

2 inoculations from typical canker on bark, both successful.
2 inoculations from pustules on nut, both successful.
2 inoculations from mycelium on nut, one successful.
10 checks cut with sterile knife, none infected.
2 checks cut with contaminated knife, none infected.

These inoculations indicate that the disease was present on or in the nuts and burs collected. Although the latter were not used in the inoculations, the nuts and burs were covered with the same fungus, judging only from an examination with a hand lens; and, moreover, the nuts and burs were in contact when collected.

Perhaps nuts infected in this manner are not likely often to reach the market, and presumably would be unsalable either for seed purposes or for eating if they did reach it. In the latter case an additional source of danger would be created by discarding the diseased nuts, perhaps in a new locality far distant from the place where they were grown. In any event, the possibility of the disease at times being disseminated through great distances in this manner can not be overlooked in summing up the evidence bearing on this phase of investigation.

J. Franklin Collins
Office of Investigation in Forest Pathology, Bureau of Plant Industry,
Providence, R. I.,
October 20, 1913

Interglacial Mollusks from South Dakota

Mr. W. H. Over, of the University of South Dakota Museum, recently submitted for study a most interesting collection of interglacial mollusks. The material, consisting of wood, cones, shells, etc., in muck, were found in a well 20 feet below the surface, two or three miles north of Grandview, in Douglas County, South Dakota.

Professor James E. Todd thus refers to this material:[1]

An Ancient Tamarack Swamp.—Near Grandview, in the southeast quarter of sec. 33, T. 100, R. 64, were found traces of more recent occupation of the region by trees. In a well which had been dug on the edge of a basin near a branch of Andes Creek at the depth of 20 feet was found a layer of muck several inches in thickness, in which were pieces of wood with numerous fresh-water shells of nearly a dozen species. But the most remarkable thing was the stem of a hemlock or tamarack about 10 inches in diameter lying across the well, and in the muck were numerous cones evidently of the same species. Overlying this trace of a tamarack swamp was mud of various colors and consistency, evidently washed from the surrounding hillsides. That it should be so deeply buried was chiefly explained by its connection with the channel of Andes Creek. This was conclusive evidence that the region had been occupied more or less by timber since the ice had covered the region, possibly while the second moraine was in process of formation. Similar finds are reported from wells several miles west of that place.

The overlying till here is Wisconsin, which varies greatly in thickness. The surface is yellow clay underlain by blue clay. The

[1] Bull. 158, U. S. Geol. Survey, p. 121, 1899.

former is Wisconsin while the latter is apparently Kansan. Professor Todd evidently correlates the deposit with the later Wisconsin when he says:

> This was conclusive evidence that the region had been occupied more or less by timber since the ice had covered the regions, possibly while the second moraine was in process of formation.

The late work of the Iowa geologists, Calvin, Shimek and others, indicates that the underlying blue clay was laid down by the Kansan ice sheet, and hence the fossil remains must be regarded as post-Kansan and pre-Wisconsin.

From this new angle of view the fossils become of great interest. The mollusks were submitted by Professor Todd to Professor R. Ellsworth Call, who recognized the following species.[2]

Limnophysa palustris Say.
Limnophysa decidiosa Say.
Gyraulus parvus Say.
Valvata sincera Say.
Segmentina armigera Say.

But five species are here recorded, although Professor Todd refers to "nearly a dozen species."

In the material submitted by Mr. Over, which is a part of the original lot, fifteen species are recognized, as noted below:

Pisidium compressum Prime.
Pisidium variabile Prime.
Pisidium medianum Sterki.
Valvata tricarinata Say.
Valvata lewisii Currier.
Succinea avara Say.
Physa sp. (immature).
Galba palustris Müll.
Lymnœa stagnalis appressa Say.
Planorbis trivolvis Say.
Planorbis bicarinatus Say.
Planorbis bicarinatus striatus Baker.
Planorbis deflectus Say.
Planorbis parvus Say.
Planorbis exacuous Say.

Two species, *Segmentina armigera* and *Limnophysa (Galba) decidiosa,* mentioned by Call, were not detected in the material recently examined. Thirteen species are likewise included which were not mentioned by Call, possibly because the material did not contain them. *Valvata sincera* as identified by Call also proves to be *Valvata lewisii.*

The fauna is thus seen to have been large and varied. The deposit was evidently the bed of a large lake or river, and could not have been a tamarack swamp as stated by Professor Todd, because mollusks such as *Valvata tricarinata* and *V. lewisii* do not inhabit such a station. The tamarack log and cones mentioned probably floated from the shore and became buried in the mud. That this fauna lived in or near the present Andes Creek is not at all possible, because such an assemblage of life would scarcely be found in this kind of a habitat.

With just which interglacial stage this biota is to be correlated is not yet clear. If it immediately preceded the Wisconsin, which seems probable, it may be Peorian (post-Iowan); or if it became extinct before this stage it may be the equivalent of the Sangamon (post-Illinoian); if it is to be classed as post-Kansan, as it lies upon the Kansan till, it must be correlated with the Yarmouth stage. In the absence of equivalent loess deposits it is difficult, if not impossible, to place this deposit in its true position in the paleontologic column. A restudy of the Grandview deposits from the modern, multiple glacial standpoint would assist greatly, doubtless, in solving this problem.

My thanks are due to Dr. Bryant Walker and Dr. Victor Sterki for kind assistance in the determination of doubtful material.

FRANK C. BAKER
THE CHICAGO ACADEMY OF SCIENCES

[2] *Op. cit.*, p. 121, footnote. The old momenclature is used.

THE INDIANA ACADEMY OF SCIENCES

THE Indiana Academy of Sciences and the Indiana Conservation Association met in joint session in Indianapolis, October 24–25. Some of the important papers were as follows:

President Donaldson Bodine's address on "How to Increase the Efficiency of the Academy."

"The Flood of March, 1913."

At Terre Haute, Charles R. Dryer.

At Fort Wayne, L. C. Ward.

On the Ohio River in Southeastern Indiana, Glen Culbertson.

On East and West Forks of White River, H. P. Bybee.

"The Selective Action of Gentian Violet in the Bacteriological Analysis," C. M. Hilliard.

"The Vertical Distribution of Plankton in Winona Lake," Glenwood Henry.

"A Test of Indiana Varieties of Wheat Seed for Internal Fungous Infection," George N. Hoffer.

"A Simple Apparatus for the Study of Phototropic Responses in Seedlings," George N. Hoffer.

"Mosses of Monroe County, Indiana, II.," Mildred Nothnagel.

"Observations on the Aquatic Plant Life in White River Following the Spring Flood of 1913," Paul Weatherwax.

"The Occurrence of *Aphanomyces phycophytes* upon the Campus of Indiana University," Paul Weatherwax.

"Food and Feeding Habits of *Unio*," William Ray Allen.

"Oral Respiration in *Amphiuma* and *Cryptobranchus*," H. L. Bruner.

"Respiration and Smell in Amphibians," H. L. Bruner.

"General Outline of Trip of 1913 for the Purpose of Collecting the Fish Fauna of Colombia, S. A.," Charles E. Wilson.

"A Topographic Map of the Terre Haute Area," Charles R. Dryer.

"Center of Area and Center of Population of Indiana," W. A. Cogshall.

"On the Shrinkage of Photographic Paper," R. R. Ramsey.

"A Preliminary Account of an Elaborate Study of the Disintegration of Matter," A. L. Foley.

"Boiling and Condensing Points of Alcohol-water Mixtures," P. N. Evans.

"Race Suicide," Robert Hessler.

"A Psychologist's Investigation in the Field of Crime among Adolescents," R. B. von KleinSmid.

"Agricultural Work in Southern Indiana," C. G. Phillips.

"The Germination of *Arisæma dracontinus*." Lantern. F. L. Pickett.

"The Prothallium of *Camptosorus rhizophyllus*." Lantern. F. L. Pickett.

"Irish Potato Scab as Affected by Fertilizers Containing Sulphates and Chlorides." Lantern. S. D. Conner.

"Newly Discovered Phenomena Connected with the Electric Discharge in Air." Lantern. A. L. Foley.

"The Relation of the Country Life Movement to Conservation," Mrs. Virginia C. Meredith.

"The Conservation of Indiana Soils and Crops," Mr. D. F. Maish.

"The Present Status of Agricultural Education in Indiana," Professor George I. Christie.

"A Sanitary Survey of Indiana Rivers," Dr. Jay Craven.

"The Relation of the Lakes of Northern Indiana to Problems of Flood Control," Dr. Will Scott.

"Municipal Forestry in Indiana," Hon. Charles Warren Fairbanks.

"First Steps in Indiana Forestry," Professor Stanley Coulter.

"Taxation of Forest Lands," Professor H. W. Anderson.

"Forests and Floods," Professor F. M. Andrews.

"Prevention of Infant Mortality as a Factor in Conservation," Dr. J. N. Hurty.

"The Analysis of an Occupation," Professor M. E. Haggerty.

"School Hygiene as a Factor in the Conservation of Human Life," Dr. O. B. Nesbit.

"County Tuberculosis Hospitals as a Factor in the Conservation of Human Life," Dr. James Y. Welborn.

"Playgrounds and Recreation Centers as Factors in the Conservation of Human Life," Dr. W. A. Gekler.

"Public Toilet Facilities, Drinking Fountains and Public Spitting in Relation to the Conservation of Human Life," Professor C. M. Hilliard.

"Possible Dangers from Drilling for Oil and Gas in Coal Measures," Professor Edward Barrett.

"Power Economy and the Utilization of Waste in the Quarry Industry," Mr. G. C. Mance.

A. J. Bigney,
Secretary

THE CONVOCATION WEEK MEETING OF SCIENTIFIC SOCIETIES

The American Association for the Advancement of Science and the national scientific societies named below will meet at Atlanta, Ga., during convocation week, beginning on December 29, 1913.

American Association for the Advancement of Science.—President, Professor Edmund B. Wilson,

Columbia University; retiring president, Professor Edward C. Pickering, Harvard College Observatory; permanent secretary, Dr. L. O. Howard, Smithsonian Institution, Washington, D. C.; general secretary, Professor Harry W. Springsteen, Western Reserve University, Cleveland, Ohio; secretary of the council, Professor William A. Worsham, Jr., State College of Agriculture, Athens, Ga.

Section A—Mathematics and Astronomy.—Vice-president, Dr. Frank Schlesinger, Allegheny Observatory; secretary, Professor Forest R. Moulton, University of Chicago, Chicago, Ill.

Section B—Physics.—Vice-president, Professor Alfred D. Cole, Ohio State University; secretary, Dr. W. J. Humphreys, Mount Weather, Va.

Section C—Chemistry.—Vice-president, Dr. Carl L. Alsberg, Bureau of Chemistry; secretary, Dr. John Johnston, Geophysical Laboratory, Washington, D. C.

Section D—Mechanical Science and Engineering.—Vice-president, Dr. O. P. Hood, U. S. Bureau of Mines; secretary, Professor Arthur H. Blanchard, Columbia University, New York City.

Section E—Geology and Geography.—Vice-president, J. S. Diller, U. S. Geological Survey; secretary, Professor George F. Kay, University of Iowa.

Section F—Zoology.—Vice-president, Dr. Alfred G. Mayer, Carnegie Institution of Washington; secretary, Professor Herbert V. Neal, Tufts College, Mass.

Section G—Botany.—Vice-president, Professor Henry C. Cowles, University of Chicago; secretary, Professor W. J. V. Osterhout, Harvard University, Cambridge, Mass.

Section H—Anthropology and Psychology.—Vice-president, Professor Walter B. Pillsbury, University of Michigan; acting secretary, Dr. E. K. Strong, Jr., Columbia University, New York City.

Section I—Social and Economic Science.—Vice-president, Judson G. Wall, Tax Commissioner, New York City; secretary, Seymour C. Loomis, 69 Church St., New Haven, Conn.

Section K—Physiology and Experimental Medicine.—Vice-president, Professor Theodore Hough, University of Virginia; secretary, Dr. Donald R. Hooker, Johns Hopkins Medical School, Baltimore, Md.

Section L—Education.—Vice-president, Dr. Philander P. Claxton, Commission of Education, Washington, D. C.; secretary, Dr. Stuart A. Courtis, Liggett School, Detroit, Mich.

The Astronomical and Astrophysical Society of America.—December 29–January 3. President, Professor E. C. Pickering, Harvard College Observatory; secretary, Professor Philip Fox, Dearborn Observatory, Evanston, Ill.

The American Physical Society.—December 29–January 3. President, Professor B. O. Peirce, Harvard University; secretary, Professor A. D. Cole, Ohio State University, Columbus, Ohio.

The American Federation of Teachers of the Mathematical and the Natural Sciences.—Between December 30. President, Professor C. R. Mann, University of Chicago; secretary, Dr. Wm. A. Hedrick, Washington, D. C.

The Entomological Society of America.—December 30–31. President, Dr. C. J. S. Bethune, Ontario Agricultural College; secretary, Professor Alexander D. MacGillivray, 603 West Michigan Ave., Urbana, Ill.

The American Association of Economic Entomologists.—December 31–January 2. President, Professor P. J. Parrott, Geneva, N. Y.; secretary, A. F. Burgess, Melrose Highlands, Mass.

The Botanical Society of America.—December 30–January 2. President, Professor D. H. Campbell, Stanford University; secretary, Dr. George T. Moore, Botanical Garden, St. Louis, Mo.

The American Phytopathological Society.—December 30–January 2. President, F. C. Stewart, Agricultural Experiment Station, Geneva, N. Y.; secretary, Dr. C. L. Shear, Department of Agriculture, Washington, D. C.

The American Microscopical Society.—December 30. Secretary, T. W. Galloway, James Millikin University, Decatur, Ill.

American Association of Official Horticultural Inspectors.—December 29. President, E. L. Worsham, Atlanta, Ga.; secretary, J. G. Saunders, Madison, Wis.

The Southern Society for Philosophy and Psychology.—December 31–January 1. President, Professor H. J. Pearce, Gainesville, Ga.; secretary, Professor W. C. Ruediger, George Washington University, Washington, D. C.

The Sigma Xi Convention.—December 30. President, Professor J. McKeen Cattell, Columbia University; recording secretary, Professor Dayton C.

Miller, Case School of Applied Science, Cleveland, Ohio.

Gamma Alpha Graduate Scientific Fraternity.—December 30. President, Professor J. I. Tracey, Yale University; secretary, Professor H. E. Howe, Randolph-Macon College, Ashland, Va.

PHILADELPHIA

The American Society of Naturalists.—December 31. President, Professor Ross G. Harrison, Yale University; secretary, Dr. Bradley M. Davis, University of Pennsylvania, Philadelphia, Pa.

The American Society of Zoologists.—December 30–January 1. *Eastern Branch:* President, Dr. A. G. Mayer, Tortugas, Fla.; secretary, Professor J. H. Gerould, Dartmouth College. *Central Branch* December 29–January 1: president, Professor H. B. Ward, University of Nebraska; secretary, Professor W. C. Curtis, University of Missouri, Columbia, Mo.

The American Physiological Society.—December 29–31. President, Dr. S. J. Meltzer, Rockefeller Institute for Medical Research, New York City; secretary, Professor A. J. Carlson, University of Chicago, Chicago, Ill.

The Association of American Anatomists.—December 29–31. President, Professor Ross G. Harrison, Yale University; secretary, Professor G. Carl Huber, 1330 Hill Street, Ann Arbor, Mich.

The American Society of Biological Chemists.—December 29–31. President, Professor A. B. Macallum, University of Toronto; secretary, Professor Philip A. Shaffer, 1806 Locust St., St. Louis, Mo.

The Society for Pharmacology and Experimental Therapeutics.—December 30–31. President, Dr. Torald Sollmann, Western Reserve University Medical School, Cleveland, Ohio; secretary, Dr. John Auer, Rockefeller Institute for Medical Research, New York City.

NEW YORK CITY

The American Mathematical Society.—December 30–31. President, Professor E. B. Van Vleck, University of Wisconsin; secretary, Professor F. N. Cole, 501 West 116th Street, New York City. Chicago, December 26, 27, secretary of Chicago meeting, Professor H. E. Slaught, University of Chicago, Chicago, Ill.

The American Anthropological Association.—December 29–31. President, Professor Roland B. Dixon, Harvard University; secretary, Professor George Grant MacCurdy, Yale University, New Haven, Conn.

The American Folk-Lore Society.—December 31. President, John A. Lomax, University of Texas; secretary, Dr. Charles Peabody, 197 Brattle St., Cambridge, Mass.

PRINCETON

The Geological Society of America.—December 30–January 1. President, Professor Eugene A. Smith, University of Alabama; secretary, Dr. Edmund Otis Hovey, American Museum of Natural History, New York City.

The Association of American Geographers.—Probably meets at Princeton but official information has not been received.

The Paleontological Society.—December 31–January 1. President, Dr. Charles D. Walcott, Smithsonian Institution; secretary, Dr. R. S. Bassler, U. S. National Museum, Washington, D. C.

NEW HAVEN

The American Psychological Association.—December 30–January 1. President, Professor Howard C. Warren, Princeton University; secretary, W. Van Dyke Bingham, Dartmouth College, Hanover, N. H.

The American Philosophical Association.—December 29–31. President, Professor E. B. McGilvary, University of Wisconsin; secretary, Professor E. G. Spaulding, Princeton, N. J.

MINNEAPOLIS

The American Economic Association.—December 27–30. President, Professor David Kinley, University of Illinois; secretary, Professor T. N. Carver, Harvard University, Cambridge, Mass.

The American Sociological Society.—December 27–30. President, Professor Albion W. Small, University of Chicago; secretary, Scott E. W. Bedford, University of Chicago, Chicago, Ill.

WASHINGTON, D. C.

The American Association for Labor Legislation.— December 30–31. President, Professor W. W. Willoughby, Princeton University; secretary, Dr. John B. Andrews, 131 East 23d St., New York City.

MONTREAL

The Society of American Bacteriologists.—December 31–January 2. President, Professor C. E. A. Winslow, College of the City of New York; secretary, Dr. A. Parker Hitchens, Glenolden, Pa.